Aug. 21, 1956 C. C. HUNT 2,759,443

MACHINE FOR MANUFACTURING REVERSIBLE PILE FABRIC AND A PRODUCT THEREFROM KNOWN AS "CHENILLE"

Filed March 27, 1952 4 Sheets-Sheet 1

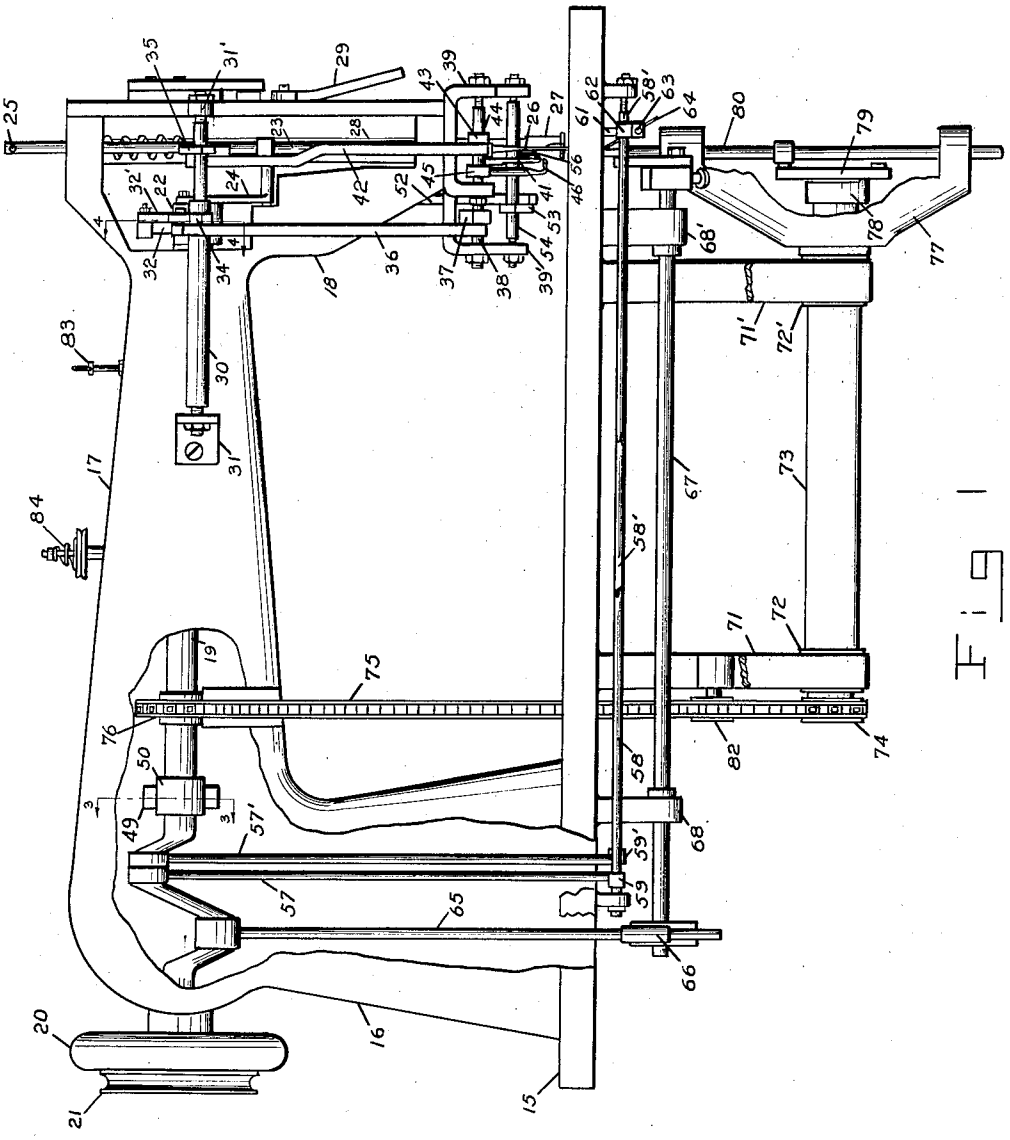


Fig 1

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Fig 2

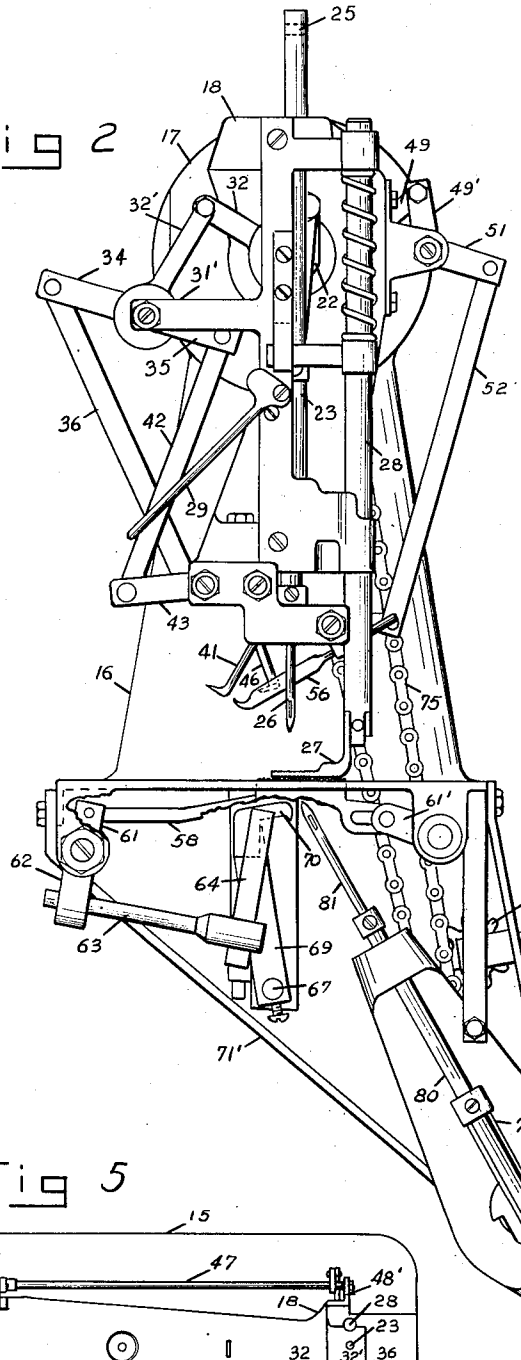


Fig 3

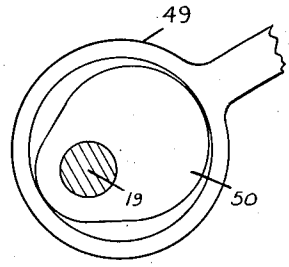


Fig 4

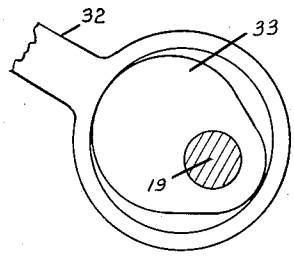


Fig 5

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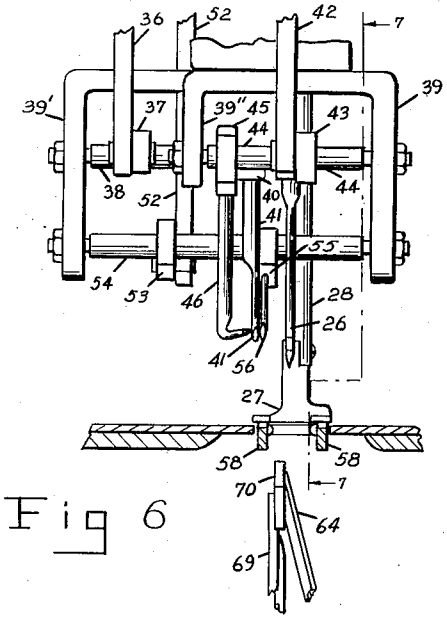


Fig 6

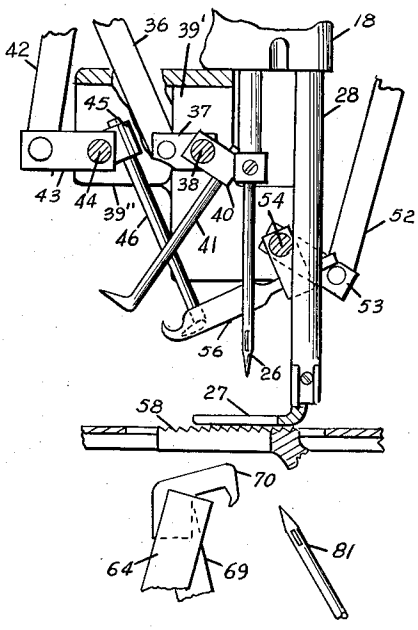


Fig 7

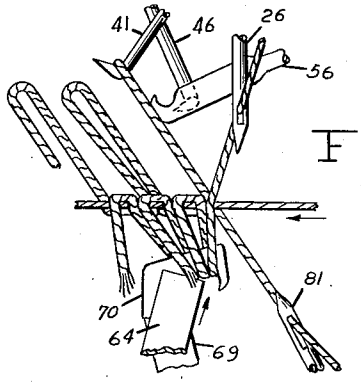


Fig 8

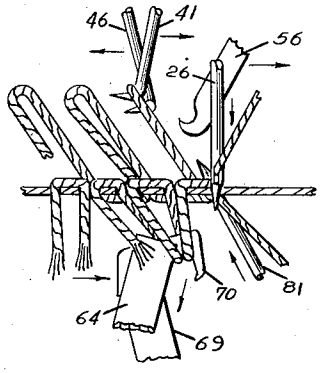


Fig 9

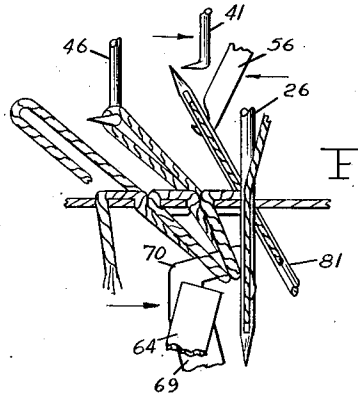


Fig 10

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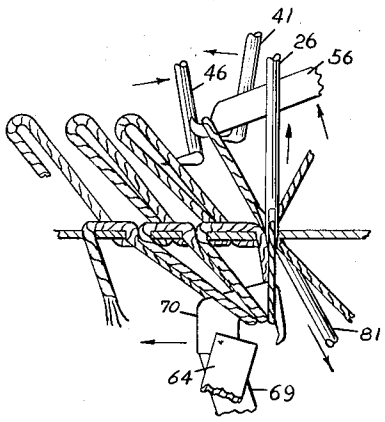


Fig 11

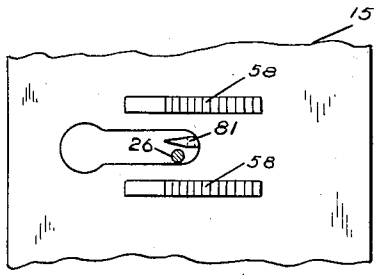


Fig 12

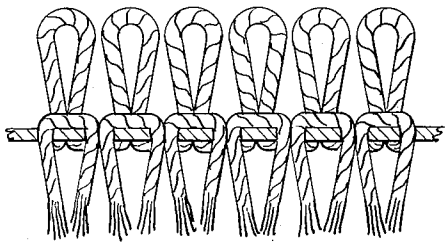


Fig 13

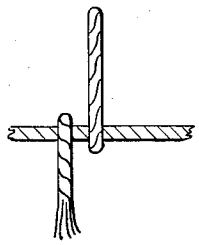


Fig 14

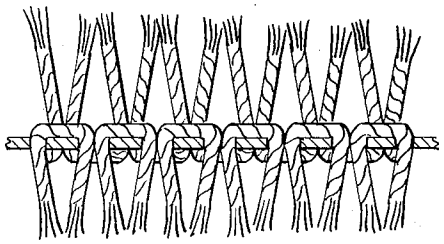


Fig 15

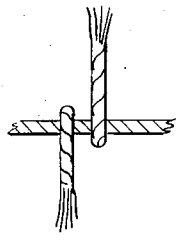


Fig 16

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United States Patent Office 2,759,443 Patented Aug. 21, 1956

2,759,443

MACHINE FOR MANUFACTURING REVERSIBLE PILE FABRIC AND A PRODUCT THEREFROM KNOWN AS "CHENILLE"

Charles C. Hunt, Calhoun, Ga.

Application March 27, 1952, Serial No. 278,785

5 Claims. (Cl. 112—79)

This invention relates to reversible pile fabrics and more particularly to a machine for manufacturing reversible pile fabric and a product therefrom commonly known as "chenille."

In the past, pile fabric has been formed by passing pile yarn through a fabric base at successively spaced points to form a series of loops on one or both sides of the fabric, which loops may be cut on one or both sides to provide chenille ends. Each increment of thread however extends through only one hole in the fabric base; and so, with normal wear, great numbers of these increments will be pulled out entirely or displaced from their symmetrical length arrangement to give a bumpy and uneven appearance to the product.

Accordingly, it is an object of my invention to provide a pile fabric having pile tufts on both sides, and in which fabric each yarn increment is looped through at least two holes in the base material.

Another object of my invention is to provide a reversible fabric which has long wearability and from which the yarn increments forming the pile cannot be pulled out easily.

Another object of my invention is to provide a reversible fabric wherein one yarn forms tufts on one side of the fabric base and another yarn forms tufts on the other side thereof.

Another object of my invention is to provide a machine which will simultaneously stitch both sides of a fabric base with separate yarns.

Another object of my invention is to provide a machine which will produce a chenille fabric having pile tufts on both sides, and in which the yarn increments on its faces will be looped through at least two holes in the fabric base.

Other and further objects and advantages of my invention will become apparent from the following disclosure when taken in conjunction with the accompanying drawings wherein like characters of reference designate corresponding parts throughout the several views, and wherein:

Fig. 1 is a partially broken side elevation of a machine constructed according to my invention.

Fig. 2 is an end elevation of the machine shown in Fig. 1.

Fig. 3 is a cross-sectional view taken along line 3—3 of Fig. 1.

Fig. 4 is a cross-sectional view taken along line 4—4 of Fig. 1.

Fig. 5 is a top plan view of a portion of the machine shown in Fig. 1.

Fig. 6 is a view of a detail showing the needles of the machine illustrated in Fig. 1.

Fig. 7 is a side view of the detail shown in Fig. 6.

Figs. 8, 9, 10 and 11, inclusive, are schematic views showing the operation of the elements shown in Figs. 6 and 7.

Fig. 12 is a fragmentary view of a detail.

Fig. 13 is a cross-sectional view showing fabric manufactured according to my invention.

Fig. 14 is an end view of the fabric shown in Fig. 13.

Fig. 15 is a cross-sectional view showing a modified form of fabric.

Fig. 16 is an end view of the fabric shown in Fig. 15.

Construction

Referring now in detail to the embodiment chosen for purpose of illustration, numeral **15** denotes a horizontal base which forms a work support for the machine structure comprising an upstanding stock **16**, tubular arm **17** and sewing machine head **18**, all arranged in conventional manner. Extending horizontally through tubular arm **17** is drive shaft **19** which is journaled therein and is provided at one end with a conventional hand wheel **20** and drive pulley **21** positioned outwardly of stock **16**. The other end of shaft **19** is provided with a balanced crank **22** to reciprocate needle bar **23** through bracket **24**. Needle bar **23** is mounted on head **18** for up and down reciprocating motion and is provided with an aperture **25** at its upper end. The lower end of needle bar **23** is fitted with needle **26** which is retained by a set screw or the like. The sewing machine head is further fitted with a presser foot **27** supported by a foot bar **28** and having a lifting lever **29** all arranged in conventional manner.

As seen in Fig. 5, a pair of rocker arm assemblies are located on either side of tubular arm **17**, the front assembly consisting of shaft **30** journaled on brackets **31** and **31'** in a position parallel to drive shaft **19**. Shaft **30** is rigidly fixed to an actuator arm **32** which is pivotally connected to actuator arm **32'**. Immediately behind crank **22** on drive shaft **19** is an eccentric **33** which engages actuator arm **32'** and upon rotation of crank shaft **19**, eccentric **33** imparts reciprocating motion to arm **32'** thus rocking shaft **30** back and forth completing one cycle upon each revolution of crank shaft **19**. Rocker arms **34** and **35** extend from shaft **30** in opposite directions. The free end of arm **34** is pivotally attached to one end of linkage rod **36** which in turn is pivotally attached by its free end to lever arm **37**. A rock shaft **38** is journaled within a pair of bearing ears **39** and **39'** which depend from sewing machine head **18** to form a support therefor. Lever arm **37** and rock shaft **38** are fixed together so that as rod **36** is pushed down or pulled up by the action of rocker arm **34**, lever arm **37** reacts accordingly, thus rocking shaft **38** in one direction or the other. Rocker arm **40** is fixed to rock shaft **38** and supports intermediate hook **41**. Hook **41** is adjustably retained by rocker arm **40** so that slight adjustment in length of the hook may be effected.

The assembly attached to rocker arm **35** is identical in function to the assembly connected to arm **34**. The free end of arm **35** is pivotally attached to linkage rod **42** whose free end is pivotally attached to lever arm **43** which is fixed to rock shaft **44**. Shaft **44** is journaled between ears **39** and ear **39''** and is located in front of and parallel to rock shaft **38**. Rocker arm **45** is fixed to shaft **44** and retains withdrawing hook **46** so that slight adjustment in the length of the hook may be made. Hook **41** and hook **46** are positioned adjacent each other; therefore, upon rotation of drive shaft **19**, these hooks will be rocked back and forth in a manner similar to the legs of a person walking. The function of the hooks will be described in more detail later.

As mentioned above, a second rocker arm assembly is also located adjacent tubular arm **17**, this rear assembly consists of a shaft **47** supported for rotation between brackets **48** and **48'** in a position parallel to shaft **19**. Pivot arms **49**, **49'** cooperate with shaft **19** to rock shaft **47** back and forth when shaft **19** is rotated. Eccentric

arm 49 encompasses eccentric 50 on drive shaft 19 and which provides this arm with reciprocating motion. The free end of arm 49 is pivotally connected to arm 49' which in turn is fixed rigidly to shaft 47. An engager arm 51 extends from shaft 47 in somewhat of a horizontal position being rigidly connected thereto, and its free end is pivotally connected to linkage rod 52. Linkage rod 52 extends downwardly and its lower end is pivotally connected to lever arm 53 which in turn is rigidly fixed to rock shaft 54. Shaft 54 is journaled for rotation between ears 39 and 39'. Rocker arm 55 is fixed rigidly to shaft 54 and retains engager hook 56 by any convenient means which will allow slight adjustment in the length thereof. It is aparent therefore that upon rotation of drive shaft 19, engager hook 56 will move back and forth in a manner similar to the other hooks. As seen in Figs. 6 and 7, engager hook 56 is so arranged that it acts somewhat directly up and down and at times becomes adjacent to intermediate hook 41.

As may be seen in Figs. 1 and 2, drive shaft 19 is provided with a pair of opposed throw arms within the junction of stock 16 and tubular arm 17. A pair of connecting rods 57, 57' engage one of these throw arms and extend down through stock 16 and base 15 to provide actuation for the fabric feeding mechanism 58 located below foot 27, through associated equipment consisting of levers 59, 59', pivot axles 60, 60', fingers 61, 61', all arranged in conventional manner. As illustrated in Fig. 1, however, a rigid member 62 is rigidly connected to axle 60 and contains a blade holder 63 pressed therein at right angles thereto. Blade holder 63 is provided with a knife blade 64 which extends to a position adjacent feeding mechanism 58 so that it may cut the yarn at the proper time.

Crank rod 65 is connected to the remaining throw rod on drive shaft 19 and extends down through stock 16 and base 15, and is journaled for reciprocating motion within sleeve 66. Sleeve 66 is fixed to a transverse rod 67 which is journaled for rotation below base 15. Rod 67 is in the same vertical plane as drive shaft 19 and is supported by bearings 68, 68' which are fixed to base 15. The end of rod 67 is fitted with a looper supporter 69 which is fixed thereto and extends upwardly adjacent blade 64. Rigidly fixed to supporter 69 is a hook shaped looper 70 which is so positioned that blade 64 bears against one side thereof and upon rotation of drive shaft 19, the end of looper 70 will pass adjacent needle 26 as it extends through an aperture provided on base 15 below foot 27. As needle 26 is withdrawn, looper 70 will remain adjacent thereto, then be drawn back.

U-shaped straps 71, 71' are fixed by their ends to the lower portion of base 15 and extend below the machinery described above. The lowest portions of these straps rigidly support journals 72 and 72', as seen in Fig. 1. Rotatably fixed within journals 72, 72' is needle actuator axle 73, one end of which is provided with sprocket 74 which engages chain drive 75. A second sprocket 76 is provided on drive shaft 19 to engage chain drive 75 and thereby rotate axle 73.

A casing 77 is fixed below base 15 and the free end of axle 73 extends into this casing. A crank disc 78 is provided on the free end of axle 73 and is connected through connecting shaft 79 to lower needle bar 80. Needle bar 80 is journaled within casing 77, as illustrated in Fig. 2, so that upon rotation of axle 73, reciprocating motion is imparted to that needle bar. Needle 81 is detachably retained within the upper end of needle bar 80 by any convenient means such as a set screw or the like. It will be noted that needle bar 80 is canted so that needle 81 does not reciprocate vertically, but passes through the fabric base at an angle of about 60° to the horizontal.

An idler sprocket 82 is fixed to strap 71 to guide chain 75 through the appropriate aperture in base 15. This sprocket serves no vital purpose and may be eliminated if desired.

A thread guide 83 and a yarn tension adjuster 84 are provided on the top of tubular arm 17 and function in the conventional way.

From the foregoing description, it will be apparent that machines constructed according to my invention will incorporate not only the mechanism usually found in chenille tufting machines but will also include another needle, or set of needles, for piercing the fabric base from the reverse direction, such needle or needles being set at an angle of approximately 30° to the conventional needle, or needles, and having separate loopers, hooks and knives set to cooperate therewith for forming tufts on the face of the base fabric opposite the face upon which tufts are formed by the conventional needle, and in a manner whereby the thread between adjacent loops or chenille ends in the same yarn passes through the base fabric at least twice.

Operation

In the operation of my machine, yarn is first threaded from an external spool through thread guide 83, then around tension adjuster 84 and back through guide 83; the end of the yarn is next threaded through aperture 25 and down over head 18 and through the eye in needle 26. A second yarn, from a second external spool which is located usually below base 15, is inserted through appropriate channels (not shown) in casing 77 and through the eye in needle 81.

A belt is attached to pulley 21 and an external motor to provide power for driving shaft 19 which, as described above, operates the remaining mechanism. Appropriate speed control mechanism may be incorporated with the motor or belt to regulate the speed of shaft 19 as desired by the operator.

The fabric base is next inserted between presser foot 27 and feeding mechanism 58, then lever 29 is released to allow presser foot 27 to apply pressure against the fabric base to retain this fabric so that both needles simultaneously pass therethrough in side-by-side relation. It will be obvious, therefore, that both needle 26 and needle 81 are in the withdrawn position when the fabric base is first inserted and that with one revolution of shaft 19 both needles will extend through the fabric and then return to their original withdrawn position as illustrated in Figs. 6 and 7.

Figs. 8 through 12, inclusive, show the operation of the needles, hooks, looper and blade through substantially one revolution of drive shaft 19. It should be remembered that each of the above mentioned members is operated from drive shaft 19 and that with each revolution of the shaft each member separately will complete one cycle of its operation. Fig. 8 illustrates the needles in the withdrawn position after these needles have sewed several loops of yarn. Fig. 9 illustrates the needles again passing through the fabric. It is to be remembered that the needles pass side-by-side within a small fraction of an inch of each other and that engager hook 56 is substantially adjacent the plane of needle 81. Also hook 41 and hook 46 are adjacent the plane of hook 56. Further, looper 70 is adjacent the plane of needle 26.

As needles 26 and 81 reach substantially the end of their travel, engager hook 56 loops under one strand of the yarn extended by needle 81; simultaneously, looper 70 extends between the yarn carried by needle 26 and the needle itself, as illustrated in Fig. 10. As the needles withdraw, engager hook 56 retains an increment of the yarn which had previously been carried by needle 81; also, looper 70 retains an increment of the yarn which was carried by needle 26. Fig. 11 illustrates clearly the function of engager hook 56 and looper 70. As the needles are withdrawn, engager hook 56 moves upwardly so that the loop of yarn retained by this member is above hook 41. As hook 56 moves up, hook 41 moves to engage the loop retained by hook 56; and, as needle 81 is withdrawn further, hook 56 again descends, leaving the loop of yarn retained by hook 41, as illustrated in Fig. 8. With further rotation of drive shaft 19, withdrawing

hook **46** passes beneath the end of hook **41** and engages the loop thus retained, and hook **41** moves rearwardly to repeat the cycle just described. Hook **46** is of such a shape that as the base fabric is fed through the machine, the loops which are separately retained by hook **46** disengage themselves therefrom.

As described above, looper **70** retains each loop of the yarn carried by needle **26**; as the needle moves up, looper **70** moves back away from the needle and blade **64** moves up as illustrated in Fig. 8; and as needle **26** again moves down blade **64** moves up, shearing against looper **70** to cut an earlier deposited loop of yarn as illustrated in Fig. 9.

Figs. 13 and 14 illustrate a section of the completed fabric; as may be seen, the yarn sewed by needle **26** forms the chenille surface while the yarn sewed by needle **81** forms the reverse side of the pile fabric. Each increment of yarn which was sewed by needle **26** is looped through two holes in the base material, and its intermediate portion is tightly drawn against the base due to the action of looper **70**. The loops formed by needle **81** on the other side are not usually cut but remain as loops. The intermediate portions of the increments of yarn between the loops and between the chenille ends appear as stitches on opposite sides of the completed fabric, but these stitches are substantially hidden by the extended tufts of yarn; however, they do serve to hold the increments of yarn securely in place. It is to be remembered that it would be a simple matter to substitute a looper similar to looper **70** and a blade similar to blade **64** for hook **41** and hook **46** and thereby provide chenille ends on both sides of the fabric, as shown in Figs. 15 and 16.

It will be obvious to those skilled in the art that many variations in the embodiment chosen for illustration may be made without departing from the scope of this invention as described in the appended claims.

I claim:

1. In a machine for forming reversible pile farbric, a work support, a reciprocating needle on one side of said work support for carrying successive doubled portions of a continuous pile yarn through a fabric base on said work support to form a pile of loops extending from one face of said fabric base, automatic means on said machine for temporarily holding said loops against withdrawal until a succeeding doubled portion of said yarn has been inserted through said fabric base, a reciprocating needle on the side of said work support opposite said first mentioned needle and directed in substantially the opposite direction from said first mentioned needle and driven in timed relation therewith for carrying successive doubled portions of continuous pile yarn through said fabric base from the face thereof opposite said first mentioned needle to form a pile of loops extending from the face of said fabric base opposite the face from which said first mentioned loops extend, drive mechanism operatively interconnecting said second mentioned needle with said first mentioned needle, and automatic means on said machine for temporarily holding said second mentioned loops against withdrawal.

2. In a machine for forming reversible pile fabric, a work support, a reciprocating needle on one side of said work support for carrying successive doubled portions of a continuous pile yarn through a fabric base on said work support to form a pile of loops extending from one face of said fabric base, automatic means on said machine for temporarily holding said loops against withdrawal until a succeeding doubled portion of said yarn has been inserted through said fabric base, a reciprocating needle on the side of said work support opposite said first mentioned needle and directed in substantially the opposite direction from said first mentioned needle and driven in timed relation therewith for carrying successive doubled portions of another continuous pile yarn through said fabric base from the face thereof opposite said first mentioned needle to form a pile of loops extending from

the face of said fabric base opposite the face from which said first mentioned loops extend, drive mechanism operatively interconnecting said second mentioned needle with said first mentioned needle, and automatic means on said machine for temporarily holding said second mentioned loops against withdrawal until a succeeding doubled portion of said second mentioned yarn has been inserted through said fabric base.

3. In a machine for forming reversible pile fabric, a work support, a reciprocating needle on one side of said work support for carrying successive doubled portions of a continuous pile yarn through a fabric base on said work support to form a pile of loops extending from one face of said fabric base, looper means on said machine for temporarily holding said loops against withdrawal until a succeeding doubled portion of said yarn has been inserted through said fabric base, a reciprocating needle on the side of said work support opposite said first mentioned needle and driven in timed relation therewith for carrying successive doubled portions of another continuous pile yarn through said fabric base from the face thereof opposite said first mentioned needle to form a pile of loops extending from the face of said fabric base opposite the face from which said first mentioned loops extend, said second mentioned needle being disposed at an angle of approximately 150 degrees to said first mentioned needle, drive mechanism operatively interconnecting said second mentioned needle with said first mentioned needle, and looper means on said machine for temporarily holding said second mentioned loops against withdrawal until a succeeding doubled portion of said second mentioned yarn has been inserted through said fabric base.

4. In a machine for forming reversible pile fabric, a work support, a reciprocating needle on one side of said work support for carrying successive doubled portions of a continuous pile yarn through a fabric base on said work support to form a pile of loops extending from one face of said fabric base, loop holding means on said machine for temporarily holding said loops against withdrawal until a succeeding doubled portion of said yarn has been inserted through said fabric base, a reciprocating needle on the side of said work support opposite said first mentioned needle and driven in timed relation therewith for carrying successive doubled portions of another continuous pile yarn through said fabric base from the face thereof opposite said first mentioned needle to form a pile of loops extending from the face of said fabric base opposite the face from which said first mentioned loops extend, drive mechanism operatively interconnecting said second mentioned needle with said first mentioned needle, loop holding means on said machine for temporarily holding said second mentioned loops against withdrawal until a succeeding doubled portion of said second mentioned yarn has been inserted through said fabric base, and means cooperating with at least one of said loop holding means for cutting certain of said loops to form chenille ends on at least one side of said fabric base.

5. In a machine for forming reversible pile fabric, a work support, a reciprocating needle on one side of said work support for carrying successive doubled portions of a continuous pile yarn through a fabric base on said work support to form a pile of loops extending from one face of said fabric base, loop holding means on said machine for temporarily holding said loops against withdrawal until a succeeding doubled portion of said yarn has been inserted through said fabric base, a reciprocating needle on the side of said work support opposite said first mentioned needle and driven in timed relation therewith for carrying successive doubled portions of another continuous pile yarn through said fabric base from the face thereof opposite said first mentioned needle to form a pile of loops extending from the face of said fabric base opposite the face from which said first mentioned loops extend, said second mentioned needle being disposed at an

angle of approximately 150 degrees to said first mentioned needle, drive mechanism operatively interconnecting said second mentioned needle with said first mentioned needle, loop holding means on said machine for temporarily holding said second mentioned loops against withdrawal until a succeeding doubled portion of said second mentinoned yarn has been inserted through said fabric base, and means cooperating with at least one of said loop holding means for cutting certain of said loops to form chenille ends on at least one side of said fabric base.

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