United States Patent [19]

Yoshihiro

[11] **3,840,949**

[45] **Oct. 15, 1974**

[54] **METHOD AND APPARATUS FOR FORMING VARIEGATING PROJECTING ON A LENGTH OF CLOTH**

[76] Inventor: **Imura Yoshihiro,** No. 7-4 Nakajimach 4-chome, Muroran-shi, Hokkaido, Japan

[22] Filed: **May 25, 1973**

[21] Appl. No.: **363,821**

[30] **Foreign Application Priority Data**

May 26, 1972 Japan 47-52284

[52] **U.S. Cl.** ..... **28/1 R,** 28/72 R

[51] **Int. Cl.** **D06c 23/00,** D06q 1/00

[58] **Field of Search** ..... 28/1 R, 72 R, 72 FT, 72.16, 28/74 R; 8/14, 148

[56] **References Cited**

UNITED STATES PATENTS

2,507,561	5/1950	Dreyfus et al.	28/74 R
2,523,690	9/1950	Finkelsteinas	28/1 R

FOREIGN PATENTS OR APPLICATIONS

13,357	1850	Great Britain	8/14

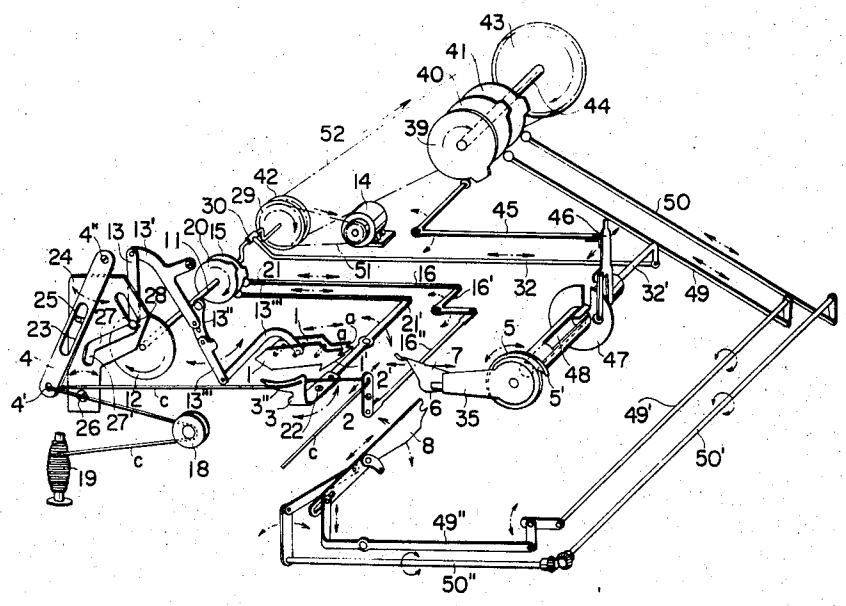
Primary Examiner—Louis K. Rimrodt

Attorney, Agent, or Firm—McGlew and Tuttle

[57] **ABSTRACT**

Variegating projections on a length of cloth are formed by wrapping a thread loop around spaced thread-retaining formations on a thread loop retaining member by guiding the thread through an oscillatable hook member and around the shank of a pivotal hook lever, pivoting the hook lever and oscillating the hook member relative to the retaining member to wrap a thread loop around the retaining formations, hooking the loop by a cloth catching member, catching a projection of the cloth on the cloth catching member, passing the loop around a rotatable body and over the cloth projection, and tensioning the thread to bind the cloth projection. The loop forming and cloth projection binding steps preferably are repeated while the cloth remains caught, after which the cloth is released. The apparatus comprises a longitudinally reciprocal thread loop retaining member having longitudinally spaced thread retaining formations, a pivoted hook lever pivotal across the path of movement of the retaining member, and a hook member oscillatable relative to the retaining member, the hook lever and the hook member having the thread guided thereby and forming the loop around the retaining portions. An oscillating rod adjusts the thread tension, and a feed needle reciprocates and oscillates relative to the cloth to catch portions of the cloth to form cloth projections which are bound by the formed loops.

10 Claims, 28 Drawing Figures



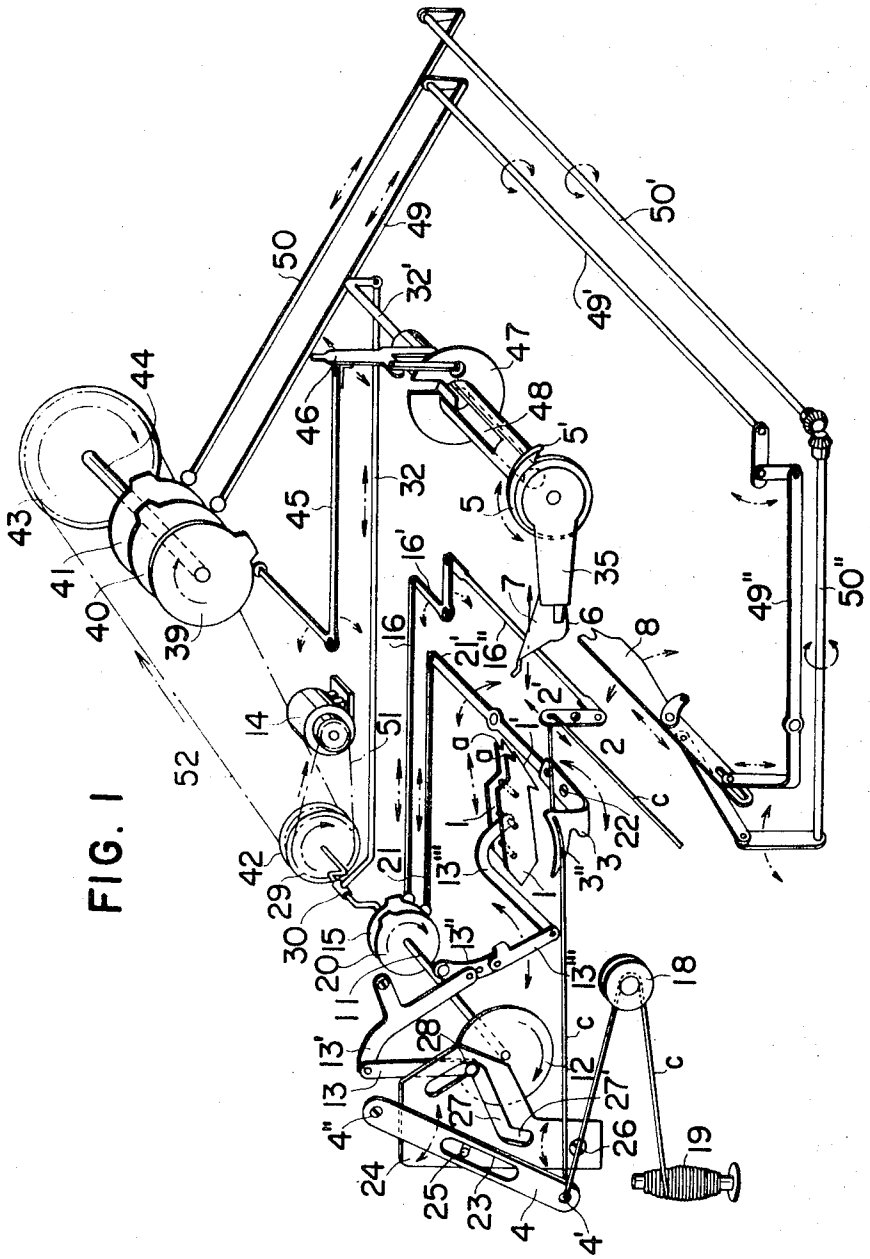


FIG. 1

FIG. 2a

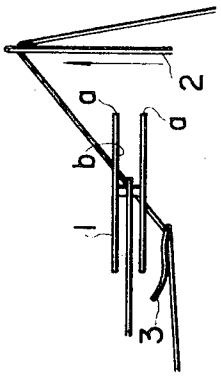


FIG. 3a

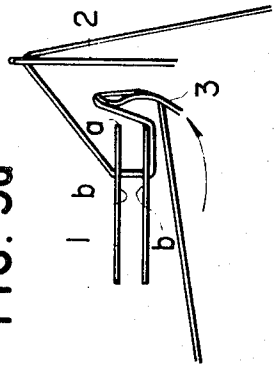


FIG. 2

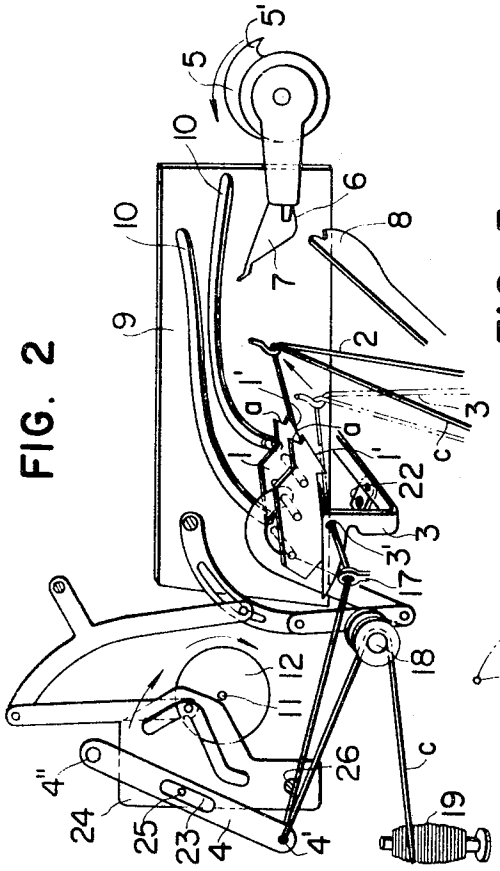


FIG. 3

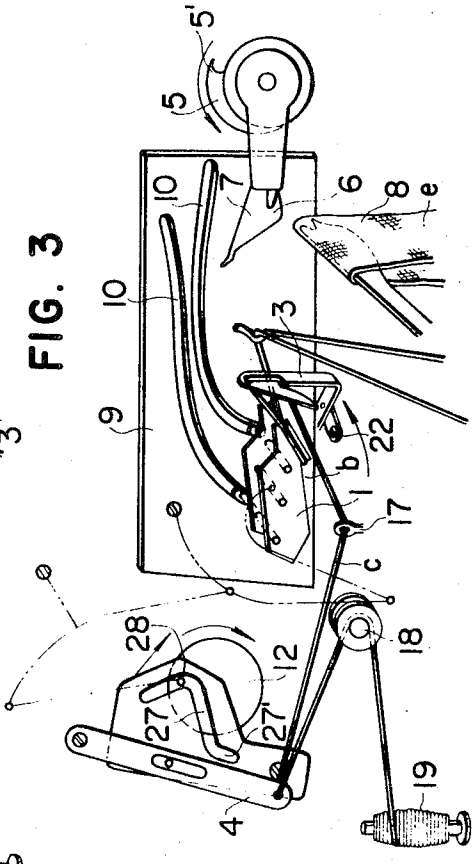


FIG. 5a

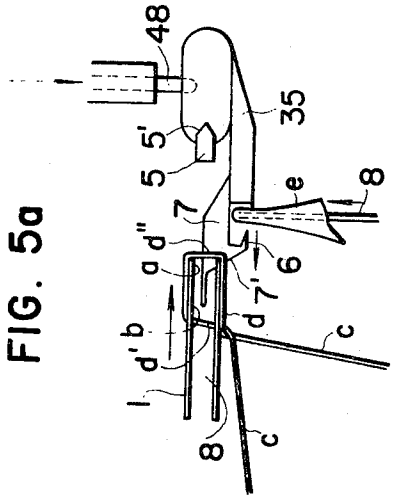


FIG. 5b

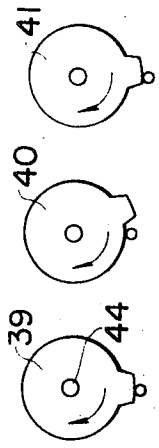


FIG. 4

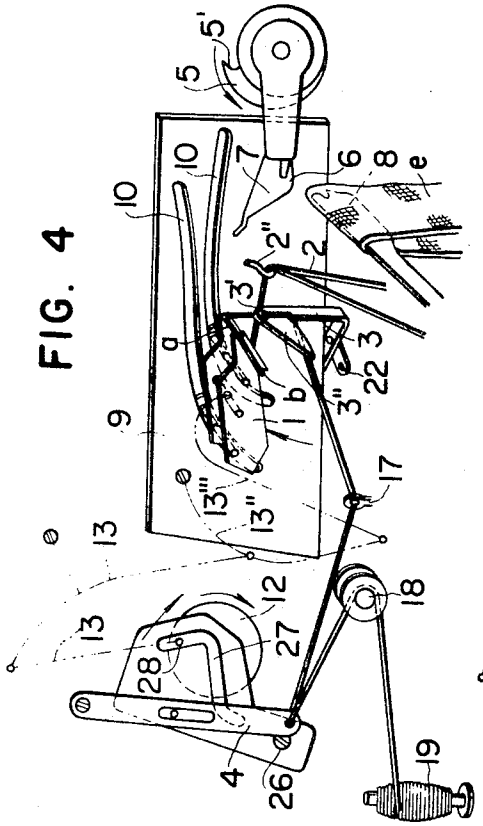
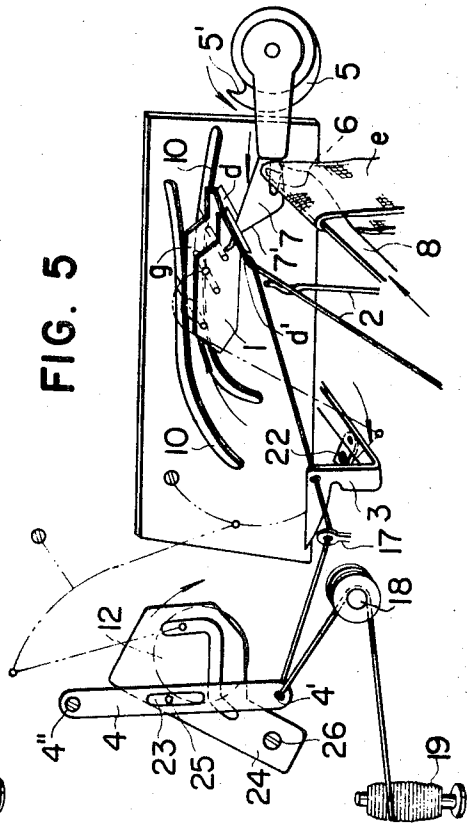


FIG. 5



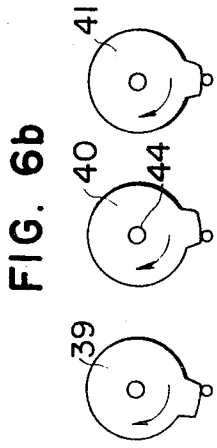


FIG. 6b

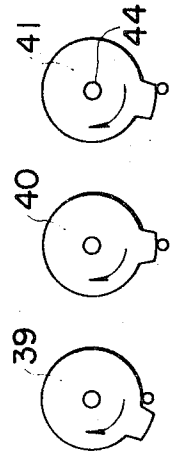


FIG. 7b

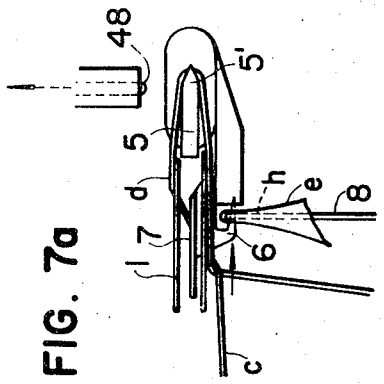


FIG. 7a

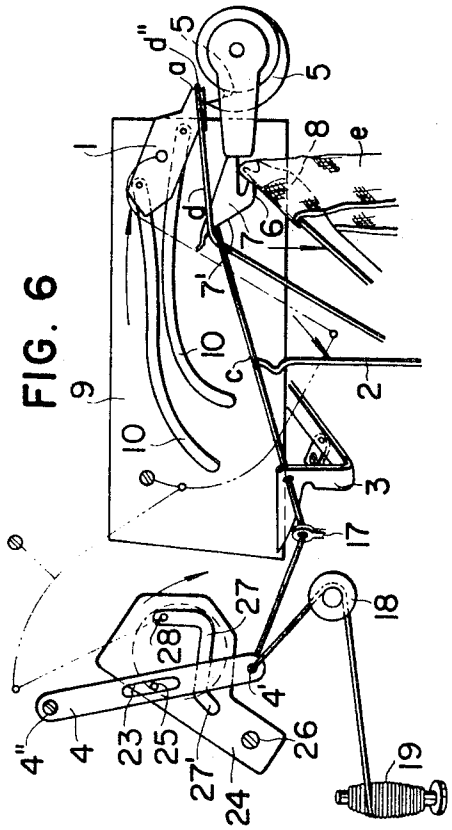


FIG. 6

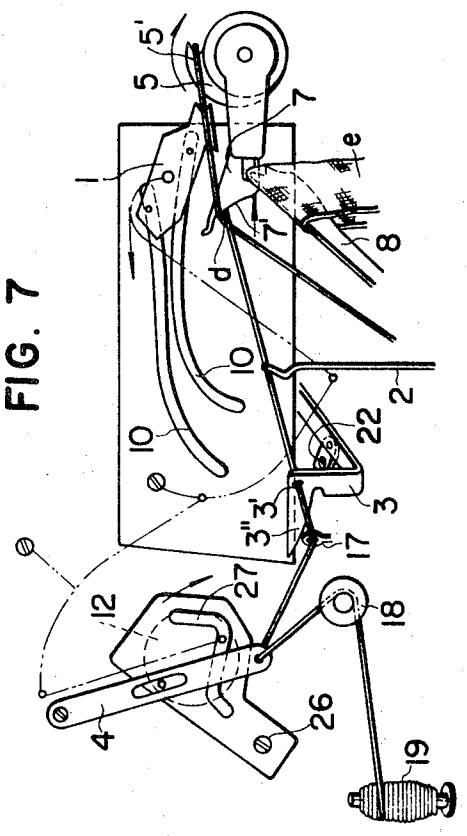


FIG. 7

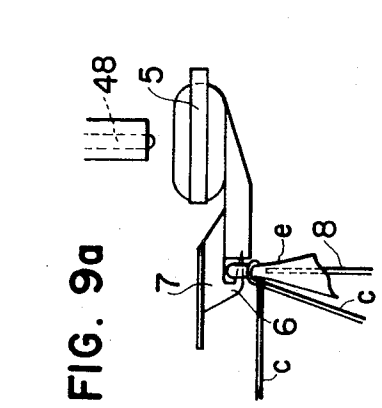


FIG. 9a

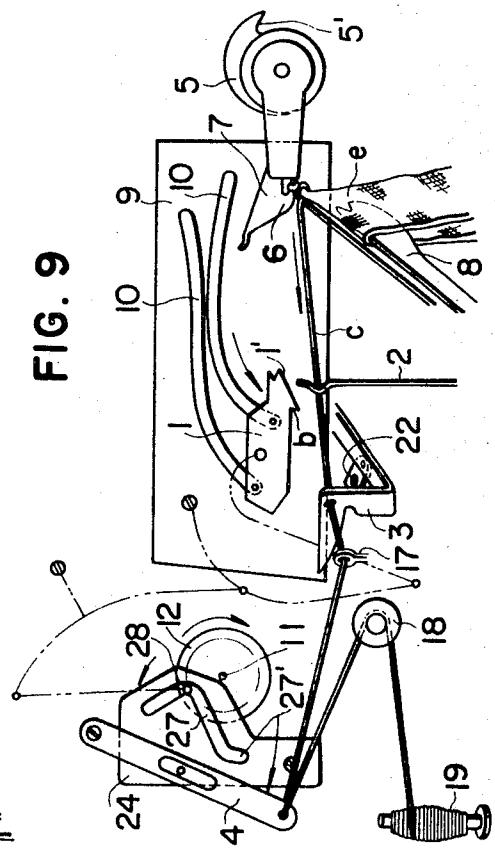


FIG. 9

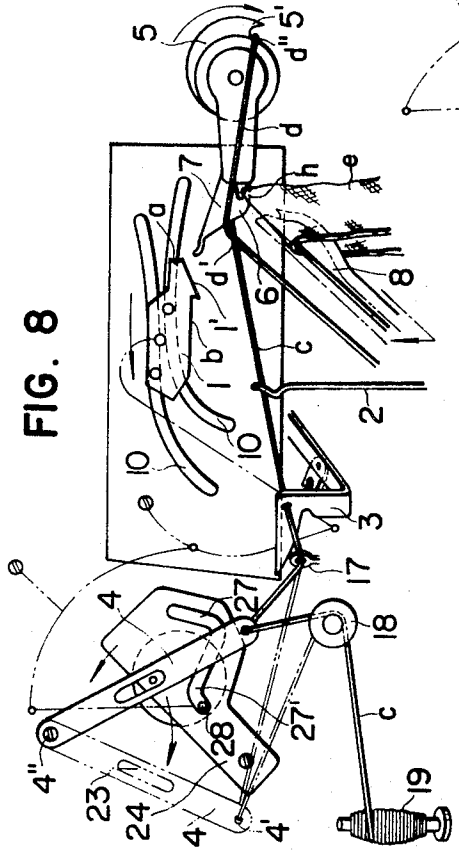


FIG. 8

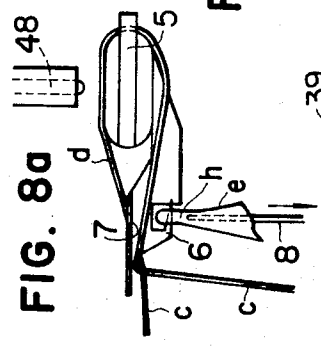


FIG. 8a

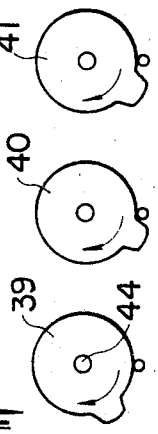


FIG. 8b

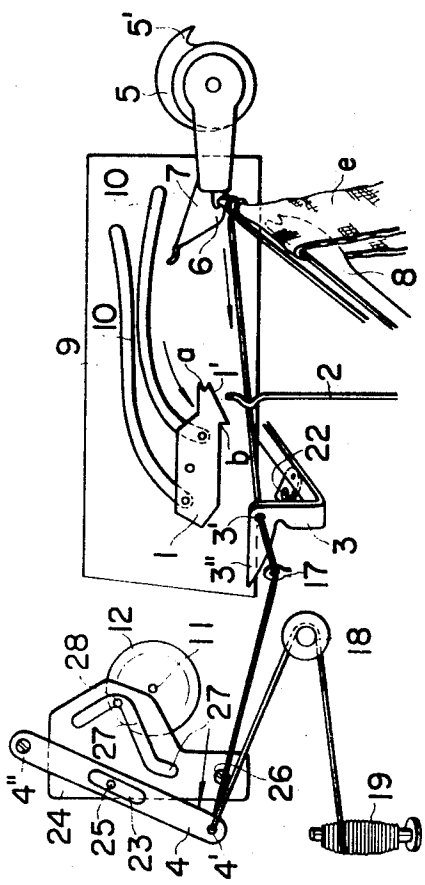

5'
5
10
7
e
6
8
10
9
a
1'
2
b
22
1
3'
3
3"
17
12
11
28
18
27
27
26
4"
19
24
25
23
4
4'

FIG. 10

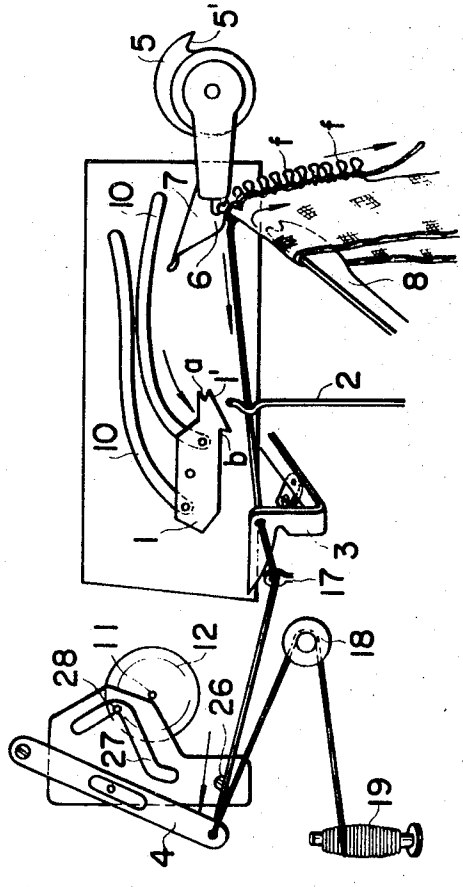

5'
5
f
f
10
7
6
8
a
1'
2
10
b
1
3
17
11
12
28
18
26
27
19
4

FIG. 11

FIG. 13

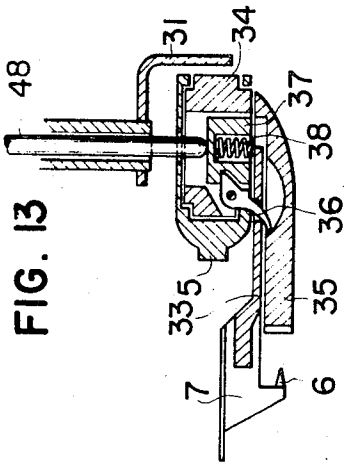


FIG. 15

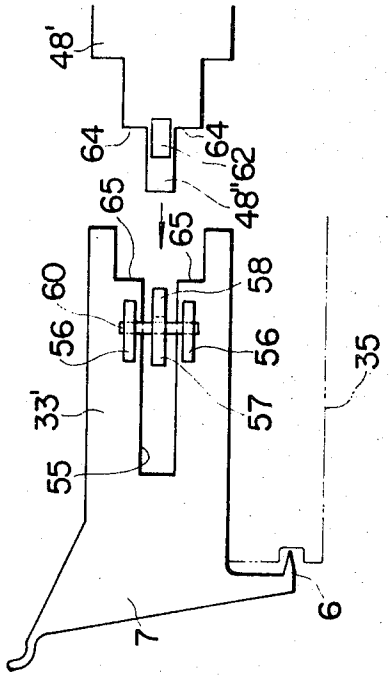


FIG. 12

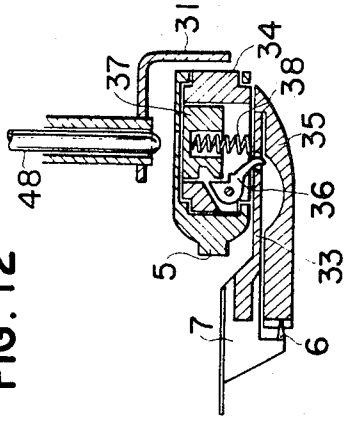


FIG. 14

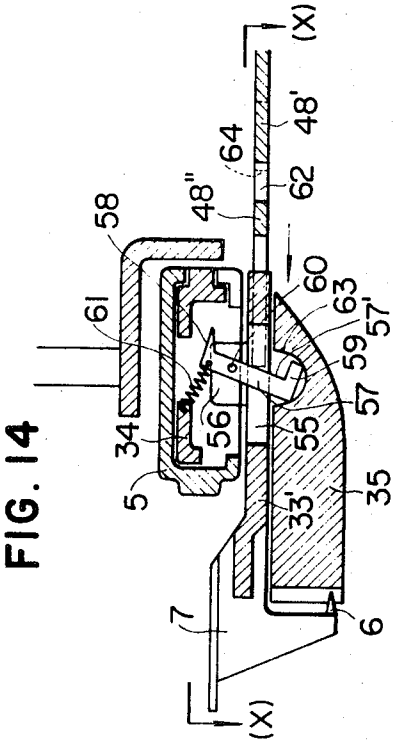


FIG. 17

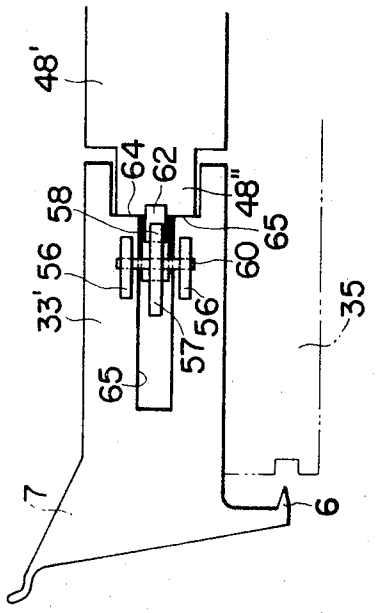


FIG. 16

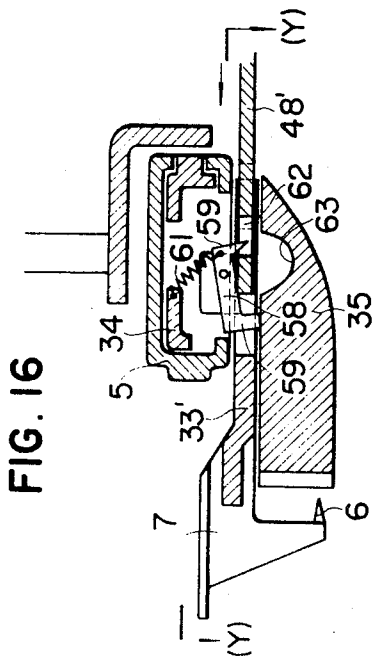
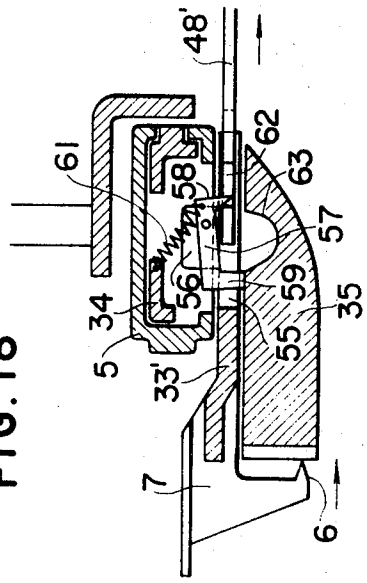


FIG. 18



METHOD AND APPARATUS FOR FORMING VARIEGATING PROJECTING ON A LENGTH OF CLOTH

FIELD AND BACKGROUND OF THE INVENTION

This invention relates to cloth treatment and, more particularly, to a continuous method for variegating cloth and an apparatus for practicing the method.

Hitherto, variegation treatment of cloth has been performed by means of complicated apparatus and a difficult and troublesome method. The conventional variegation machine comprises a thin metal rod having, at one end, a small curved needle, with the other end of the thin metal rod being secured to a beam stand. The variegation method for cloth generally comprises the steps of hooking the cloth on the small needle, binding the hooked portion of the cloth by a thread from a bobbin, and binding together the bound portion of the cloth by the thread in order to link together a large number of bound portions.

In many instances, with the prior art method and apparatus for variegating cloth, the operations have been deleterious for the health of workers and it has been impossible to increase the efficiency of the variegation method. This is due to the fact that the hooking and binding steps are performed manually while the operator must gaze closely at the small needle.

SUMMARY OF THE INVENTION

The primary objective of the present invention is to provide a novel continuous method for variegating cloth and a novel machine for performing the method, in which the aforementioned disadvantages are obviated.

Another objective of the invention is to provide an improved method for continuous variegation of cloth and an improved apparatus for performing the method, in which the cloth is variegated automatically and continuously without requiring hard work on the part of operators.

A further objective of the present invention is to provide and improved continuous method for variegating cloth, and an apparatus for performing the method, in which the cloth may be processed or treated easily and efficiently even by unskilled workers.

For an understanding of the principles of the invention, reference is made to the following description of typical embodiments thereof as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1** is an exploded perspective view of the general mechanism of the apparatus for continuous variegation of cloth;

FIGS. **2, 3, 4, 5, 6, 7, 8, 9, 10** and **11** are elevation views illustrating the operation of various portions of the mechanism, shown in FIG. **1**, in performing the sequence of steps of the method of the invention;

FIG. **2***a* is a partial plan view, corresponding to FIG. **2**, and illustrating the operating relation of a hook rod relative to a movable member, both shown in FIG. **2**;

FIG. **3***a* is a partial plan view illustrating the operating relation of an oscillating hook member relative to the movable member of FIG. **3**;

FIG. **5***a* is a partial plan view illustrating the operating relation of the movable member, a cloth feed needle and a cloth catching member, as shown in FIG. **5**;

FIG. **5***b* is an elevation view of the control cams illustrating their relative angular relation with the parts of the mechanism occupying the positions shown in FIG. **5**;

FIG. **6***b* is a view similar to FIG. **5**b but illustrating the relative angular relations of the cams with the parts occupying the positions shown in FIG. **6**;

FIG. **7***a* is a partial plan view illustrating the movable member, a rotatable body and the cloth catching member with the parts occupying the positions shown in FIG. **7**;

FIG. **7***b* is a view similar to FIGS. **5***b* and **6***b* illustrating the relative angular relations of the cams with the parts occupying the positions shown in FIG. **7**;

FIG. **8***a* is a partial plan view illustrating the operating relation of the rotatable body and the cloth feed needle with the parts occupying the positions shown in FIG. **8**;

FIG. **8***b* is an elevation view illustrating the angular relation of the control cams with the parts occupying the positions shown in FIG. **8**;

FIG. **9***a* is a partial plan view illustrating the operating relation of the rotatable body and the cloth catching member with the parts occupying the positions shown in FIG. **9**;

FIG. **10** is a perspective view, to a larger scale, showing the interrelation of parts occupying the positions shown in FIG. **11**;

FIGS. **12** and **13** are vertical sectional views illustrating two different positions of the rotatable body and the cloth catching member;

FIG. **14** is a vertical sectional view, corresponding to FIG. **12**, of a modified embodiment of the rotatable body and the cloth catching member;

FIG. **15** is a plan view taken essentially on the line *x*—*x* of FIG. **14**;

FIG. **16** is a vertical sectional view of the rotatable body and the cloth catching member shown in FIG. **14** but occupying relative positions corresponding to FIG. **13**;

FIG. **17** is a plan view taken essentially on the line *y*—*y* of FIG. **16**; and

FIG. **18** is a vertical sectional view of the embodiment of the invention shown in FIGS. **14** through **17** illustrating a further position of the parts.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. **1, 2** and **3**, a longitudinally reciprocable thread loop retaining member **1** comprises a pair of laterally spaced relatively elongated and parallel plates **1′** each having a downwardly and rearwardly sloping forward bottom edge **1″** for a purpose to be described. Plates **1′** are interconnected by three rods **1‴**, and are substantially vertically oriented. At the forward edges of the sloping surfaces **1″**, each plate **1′** is formed with a respective loop engaging notch *a* and, at the lower end of the sloping edge **1″**, each plate is formed with a rearwardly opening loop engaging notch *b*. Member **1** is arranged to be reciprocated along

guide grooves 10 formed in a guide plate 9 and, for this purpose, the two outermost connecting pins 1''' are engaged in the guide grooves 10. Member 1 is moved along guide grooves 10 by a linkage comprising links 13, 13' and 13'' which linkage is connected between a crank 12 fixed to a main shaft 1 and the central or intermediate connecting pin 1'''. With the described arrangement, movable member 1 is reciprocated along guide grooves 10 by linkage 13, 13' and 13''' responsive to rotation of crank plate 12, while being also relatively oscillated by virtue of the cam shape of the guide grooves 10.

A hook lever 2 has a hook 2' at its upper end, and is pivotal about a pivot 2''. Hook lever 2 is pivoted responsive to rotation of a cam 15 secured on main shaft 11 and through the medium of a rod 16 engaged with cam 15, a crank 16' connected to rod 16, and a rod 16'' connected between crank 16 and the lower end of hook lever 2'. By virtue of this arrangement, hook rod or lever 2 is pivoted transversely of the path of movement of loop retaining member 1 and in front of member 1, in order to hook a thread *c* into the hook 2' and to pull the thread across sloping surfaces 1'' of plates 1' of member 1 and downwardly to engage thread *c* in the engaging portions or notches *b*.

An oscillatable hook member 3 is formed from a narrow plate or strip bent into a L-shape, and a thread passing hole or aperture 3' is formed in the upper end of the vertical leg of member 3. Thread *c* wound on a bobbin 19 is threaded through a thread tension controlling means 18, an aperture 4' in an oscillating rod 4, and the eye of a thread guiding ring member 17. A projection 3'', of a generally triangular configuration, extends in coplanar relation laterally from the vertical leg of member 3.

Member 3 is pivotal about a substantially vertical pivot 22, and is oscillated about pivot 22 responsive to rotation of a cam 20 fixed to shaft 11. A rod 21 has one end engaged with cam 20 and its opposite end articulated to a lever 21' pivoted at 21'' and having its other end articulated to the free end of the horizontal arm of member 3. By virtue of this driving mechanism, and responsive to rotation of cam 30, oscillatable hook member 3 is oscillated through about 180° about the pivot 22, from one side of movable member 1 to the opposite side thereof, for the purpose of engaging thread c in the front engaging portions or notches *a* of member 1 to form a thread loop *d*.

Oscillating rod 4 is oscillatable about a pivot 4'', at the end opposite that end formed with the thread passing hole 4', and rod 4 is formed with an elongated elliptical slot 23 substantially centrally thereof. Slot 23 receives a protrusion or pin 25 on an oscillating plate 24 to operationally interconnect oscillating plate 24 and oscillating rod or link 4.

Oscillating plate 24 is oscillatable about a pivot 26 and, adjacent this pivot, is formed with a guide groove 27 having a quick return portion 27'. An eccentric pin 28 on crank plate 12 is engaged in groove 27. Thus, when an electric motor 14 is energized, a sprocket or pulley 29 secured on main shaft 11, main shaft 11 and crank plate 12 are rotated and eccentric pin 28 on crank plate 12 moves along slot or groove 27. Thereby, plate 24 is oscillated to move oscillating rod 4 and adjust the tension of thread *c*.

The free end of link 13 is secured to eccentric pin 28 so that, as crank plate 12 is revolved, loop retaining member 1 is reciprocated and oscillated along guide grooves 10.

The apparatus illustrated in FIG. 1 further includes a rotating or rotatable body 5 contained within a large-size container or housing 31 and oscillated by a crank portion 30 of main shaft 11. For this purpose, a connecting rod 32 interconnects crank portion 30 and a bent outer end of a shaft 32' coaxial with rotatable body 5. With this arrangement, rotation of main shaft 11 oscillates body 5 through about 180°.

The periphery of body 5 has a projecting hook portion 5' whereby, when body 5 is oscillated, a forward end *d''* of the thread loop *d* formed on member 1 is hooked on hook portion 5' and then the forward end *d''* is passed partly around body 5 and then drawn therefrom in order to bind a hooked portion of the cloth to provide a variegated cloth portion *f*.

A cloth catching needle 6 is formed on a lower end portion of a cloth catching member 7 in the form of a triangular plate, and is adapted to positively catch and hold the cloth *e* supplied by a feeding needle 8. As best seen in FIGS. 12 and 13, a base portion 33 of cloth catching member 7 is slidable or reciprocable into and out of an arm 35 of a stationary frame 34 within rotating or revolution body 5, and an oscillatable pin or catch 36 of stationary frame 34 is engaged in base portion 33.

With frame 34, there is disposed a sliding block 37 biased by a spring 38, and pin or catch 36 is oscillated by sliding block 37, such oscillation is controlled by a control cam 39 fixed on an auxiliary shaft 44. For this purpose, one end of a crank rod 45 pivoted at 45' is engaged with cam 39, and the other end of crank 45 is articulated to a mechanism 46 for operating catching needle 6. Mechanism 46 further includes a notched circular flat plate 47 and a pushing rod 48 which are operated, responsive to rotation of control cam 39, to reciprocate rod 48. As a result of such reciprocation, an end of rod 48 pushes sliding block 37 so that pin or catch 36 is oscillated to retract catching needle 6 from a notch 35' in arm 35 of stationary frame 34.

A cloth feeding needle 8 is oriented generally perpendicular to cloth catching needle 6, and is mounted for oscillation as well as reciprocation responsive to rotation of a control cam 40 secured to auxiliary shaft 44. For this purpose, a rod 49 has one end engaged with cam 40 and its opposite end articulated to a bent portion of a shaft 49'. The opposite end of shaft 49' also has a bent portion articulated to one end of a lever 49'' pivoted at 49'''. A shorter arm of lever 49''' is bent and its end is articulated in an elongated slot 8' of cloth feeding needle 8. The mechanism so far described effects oscillation of needle 8. Reciprocation of cloth feeding needle 8 is effected by a control cam 41 secured to auxiliary shaft 44, and engaged by one end of a rod 50 whose opposite end is connected to a bent end of a shaft 50' to oscillate this shaft. Shaft 50' oscillates a shaft 50'' to bevel gearing 50''', and a radial arm on shaft 50'' is articulated by an link 8'' to cloth feeding needle 8 to reciprocate the latter. By these operations, portions of the cloth *e* to be variegated are positively transferred or fed one at a time to the cloth catching needle 6.

Motor 14 and sprocket 29 on shaft 11 are drivingly interconnected by an endless chain 51, and a sprocket 42 secured to main shaft 11 is connected through an endless chain 52 to a sprocket 54 secured on auxiliary

shaft 44. The teeth ratio of sprockets 42 and 43 is 1:2 so that, when main shaft 11 performs one revolution, auxiliary shaft 44 performs a half revolution and, when shaft 11 makes two revolutions, shaft 44 makes one revolution.

During the second revolution of shaft 11 and the second half of the revolution of shaft 44, the cams 39, 40 and 41 are "idle," so that the portion of cloth *e* to be variegated is maintained held by catching needle 6. During the second half revolution of auxiliary shaft 44, thread *c* is again bound around cloth portion *e* to complete a variegation portion *f* of the cloth. Thus, responsive to two revolutions of shaft 11, one variegation portion *f* is formed. This operation is cyclically repeated as shaft 11 is rotated by motor 14, to form a series of variegated portions on cloth *e*. By changing the gear ratio of sprockets 42 and 43, the number of bindings of thread *c* around the caught portions of cloth *e* may be changed.

The operation of the continuous variegation appartus in performing the variegation method of the invention will now be described with reference to FIGS. 2 through 13. In advance of beginning the operation, thread *c* wound on bobbin 19, is threaded through thread tension adjuster 18, aperture 4′ of oscillating rod 4, the eye of thread guiding ring member 17, the aperture 3′ of oscillatable hook member 3, and around the shank of hook rod 2. The end of thread *c* is kept in a stretched condition manually, or else it is secured to a suitable portion of the apparatus embodying the invention. After the threading operation, electric motor 14 is started to rotate shaft 11 and crank portion 30, so that the protruding hook portion 5′ on rotating body 5 is rotated counterclockwise by the linkage 32 and 32′. Also, oscillating rod 4 is oscillated in a direction to slacken thread *c*.

Responsive to rotation of cam 15, hook rod or lever 2, as shown in FIGS. 2 and 2*a*, is pivoted, as a lever, in a direction essentially perpendicularly intersecting the path of movement of member 1 and in front of member 1 in order to hook thread *c* into hook 2′, guide thread *c* downwardly along the sloping surfaces 1″ and finally engaging thread *c* with the rearwardly facing notches *b*.

As shown most clearly in FIGS. 3 and 3*a*, by virtue of rotation of cam 20, oscillatable hook member 3 is rotated about the fulcrum shaft 22 and moves into a position in front of member 1 so that thread *c* engages the forwardly opening notches *a* in order to form a thread loop *d*. Following this, with hook lever 2 and hook member 3 maintained in the previous position, as shown in FIG. 4, the linkage 13, 13′, 13″ and 13‴ advances loop retaining member 1 along guide grooves 10.

When the advancing member 1 is moved, as shown in FIGS. 5 and 5*a*, the end edge 7′ of cloth catching portion 7, then situated in fron of member 1, passes through the space between plates 1′ of member 1 in order to pass edge 7′ through thread loop *d* and to hook the rear portion *d*′ of loop *d*. At this time, due to rotation of cam 39, catching needle 16 is separated from notch 35′ and, by virtue of rotation of cam 41, cloth feeding needle 8 is advanced. Also, due to rotation of cam 20, oscillatable hook member 3 is rotated back to its original position.

As loop retaining member 1 is moved to its most forward position, hook member 2, as shown in FIG. 6, is returned to its original position due to the rotation of cam 15, and cloth feeding needle 8 is lowered by rotation of cam 40 in order to catch variegation portions of cloth *e* one-by-one. At this time, rotatable body 5 is at the limit of its counterclockwise oscillation.

Now referring to FIGS. 7, 7*a* and 7*b*, when rotatable body 5 is now moved or rotated clockwise, hook protrusions 5′ hooks the front portion *d*″ of loop *d* which up to this time has been engaged in notches *a* of loop retaining member 1. The clockwise rotation of rotatable body 5 is continued and, simultaneously, catching needle 6, responsive to rotation of cam 39, is moved in a direction to engage and lock the portion of the cloth *e* then on the pointed portion of feeding needle 8.

Oscillating rod 4 maintains thread *c* stretched from the beginning of each cycle to the time of catching of cloth *e*. However, at this time, rod 4 is swung in a direction to pull thread *c* and to disengage it from protrusion 5′ when the hook protrusion 5′ is moved to the position shown in FIGS. 8 and 8*a*. From this position, body 5 is rotated in the opposite direction, or counterclockwise. Feed needle 8 is withdrawn due to rotation of cam 41, and is raised by rotation of cam 40 into the original position.

When oscillating rod 4 is swung clockwise, as shown in FIG. 9, and projection 28 moves along the quick return portion 27′ of guide slot 27 in oscillating plate 24, the speed of movement of rod 4 is increased in order rapidly to pull thread *c* and accordingly thread loop *d* along the periphery of movable body 5. As a result, when oscillating rod 4 is returned to its initial position shown in FIGS. 1 and 9, the thread loop *d* is bound around the variegation portion *h* of cloth *e*, as shown in FIG. 9*a*. Consequently, when it is necessary for the caught portion *h* of cloth *e* to be bound several times, the various parts mentioned above are operated as described in the foregoing in order to bind the thread around portion *h* which is kept in the caught condition by catching needle 6. With a repitition of the described steps, a series of variegated portions *f* of cloth *e* are obtained, as illustrated more particularly in FIGS. 11 and 11*a*.

The opening and closing of cloth catching member 6 can also be effected by the mechanism shown in FIGS. 14 through 18, constituting a modification of the invention. In this embodiment of the invention, base portion 33′ of cloth catching member 7 is mounted to be reciprocated into and out of arm 35 of stationary frame 34 housed in rotating body 5. Base portion 33 is flat and is provided with a rearwardly opening notch 55 therein. On the side edges of notch portion 55, there are mounted bearing members 56, 56. An actuator 57, having a channel-shape cross-section, is oscillatably mounted in bearing members 56, 56, in a position directly above notch portion 55, by means of a pin 60, and a tension spring 61 is connected between a first hook portion 58 of actuator 57 and stationary frame 34.

Push rod 48′, which is reciprocated, responsive to movement of cam 39, by the needle separating mechanism 46 and the flat plate 47, is mounted so as to move toward base portion 33′ of cloth catching member 7 in order to enter into and be withdrawn from arm 35 of stationary frame 34. Push rod 48′ is made flat at its end portion 48″, but its general configuration may be made convex. Within arm 35, end portion 48″ of push rod

48' and notch portion 55 of cloth catching member 7 confront each other.

An opening 62 is formed within end portion 48'', and a recess 63 is formed in arm 35 of stationary frame 34. Accordingly, when base portion 33' of cloth catching member 7 is withdrawn into arm 35, by reciprocating motion of push rod 48', actuator 57 rotates counterclockwise around pin 60 under the bias of spring 61, and the other or second hook portion 59 of actuator 57 is inserted or dropped into the recess 63 formed in arm 35. The first hook portion 58 of actuator 57 is disengaged from opening 62 of push rod 48', so that cloth catching needle is kept in the engaged position.

When push rod 48' is reciprocated to the left, as viewed in FIGS. 14 through 18, end portion 48'' pushes against the inner edge 57' of actuator 57 to rotate actuator 57 clockwise and to disengage second hook portion 59 of the actuator from recess 63 of arm 35. When a pressing portion 64 of end portion 48'' of push rod 48' abuts against a portion 65 formed on notch portion 55, base portion 33' is moved to the left to disengage catching needle 6 of cloth catching member 7 from notch 35' of arm 35.

In order to engage catching needle 6 with notch 35' of arm 35, push rod 48' is moved backward or to the right and first hook portion 58 of actuator 57 is engaged with opening 62 of push rod 48'. Due to the withdrawal of base 33' into arm 35, catching needle 6 is closed or engaged and cloth *e* is caught. At the same time, second hook portion 59 of actuator 57 is positioned within recess 63 of arm 35, and actuator 57 rotates counterclockwise owing to the bias of spring 61 so that cloth catching portion 7 halts. Thus, catching needle 6 is kept in its cloth holding position. Following this, first hook portion 58 of actuator 57 is disengaged from opening 62 of push rod 48', and the push rod 48' is retracted from arm 35 of stationary frame 34 housed in rotating body 5, whereby the thread loop *d* is able to pass around body 5.

It should be noted that the respective linkages for oscillating rod 48, for oscillating feeding needle 8, and for reciprocating feeding needle 8 are operated by the cams 39, 40 and 41 on auxiliary shaft 44 which, as stated, performs only one revolution for each two or more revolutions of main shaft 11. During each rotation of shaft 11, the above-described loop formation and binding operations take place, with the cloth *e* being held by the catching needle 6, which is not released until the next complete revolution of auxiliary shaft 44. Consequently, and depending upon the gear ratio between the sprockets 42 and 43, several loops of thread *c* may be bound around the caught portion of cloth *e* held by the catching needle 6, before the resulting variegating projection is released by retraction of catching needle 6 out of notch 35'of arm 35.

While specific embodiments of the invention have been shown and decribed in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A continuous method of forming a series of variegating projections on a length of cloth comprising the steps of, during each forming cycle, moving a thread loop retaining member, having forwardly and rearwardly facing thread retaining formations, forwardly along a guiding path; guiding a binding thread across the guiding path in advance of the thread loop retaining member for engaging the thread therewith to guide the thread into the rearwardly facing retaining formations; guiding the thread into the forwardly facing retaining formations to form a thread loop held in the retaining formations; hooking the rear end of the loop on a cloth catching member to disengage the loop from the rearwardly facing retaining formations as the retaining member continues to move forwardly; feeding a portion of the cloth to the catching member for catching and retaining of a caught cloth projection by the catching member; hooking a front end of the loop on a rotatable body and rotating the body to draw the loop from the forwardly facing retaining formations; releasing the loop from the rotatable body and passing the loop over the caught cloth projection; tensioning the thread to bind the caught cloth projection while retracting the loop retaining member along its guiding path; and repeating the forming cycle.

2. A continuous method of forming a series of variegating projections on a length of cloth, as claimed in claim 1, including repeating the forming cycle at least once while the respective caught cloth projection is retained by the catching member.

3. A continuous method of forming a series of variegating projections on a length of cloth, as claimed in claim 2, including the steps of, following the last repeated forming cycle, releasing the respective caught cloth projection from the catching member; and repeating the entire cycle of operations a number of times to form the series of variegating projections.

4. Apparatus for continuously forming a series of variegating projections on a length of cloth comprising, in combination, a thread loop retaining member mounted for cyclical reciprocation longitudinally of a guiding path, said member having longitudinally spaced forwardly and rearwardly facing thread retaining formations thereon; loop forming means movable transversely of an intermediate portion of said guiding path to form a binding thread loop, retained in said retaining formations, as said member is advanced from the rear end of said guiding path toward the forward end of said guiding path; a loop tensioning member mounted adjacent the rear end of said path and having an aperture through which the binding thread passes in advance of engagement with said loop forming means, said tensioning member being movable between a forward thread guiding position and a rearward thread tensioning position; means operable, during movement of said loop retaining member forwardly along its guiding path, to move said loop tensioning member from its rearward thread tensioning position toward its forward thread guiding position; an oscillatable loop guiding body adjacent the forward end of said path; a cloth catching needle mounted on said oscillatable body for movement between an open cloth receiving position and a closed cloth retaining position; a cloth feeding needle mounted for reciprocation and oscillation in a substantially vertical plane intersecting said path and operable to catch a cloth and feed a caught cloth portion to said catching needle to the open position of the latter; means then operable to move said catching needle through its cloth retaining position to retain the caught cloth portion; and means, including said oscillatable body, operable to engage the loop on said thread retaining formations, to draw the loop from said thread retaining formations and to guide the loop over

said caught cloth portion; and means operable, after said loop has been guided over said caught cloth portion, to simultaneously retract said loop retaining member toward the rear end of its guiding path and to move said tensioning member rapidly toward its rearward thread tensioning position to bind the loop around the caught cloth portion.

5. Forming apparatus, as claimed in claim **4,** including means operable to retain said cloth catching needle in its closed cloth retaining position during operation of said loop retaining member, said loop forming means, said loop tensioning member, said oscillatable loop guiding body, said cloth feeding needle, and said last-named means in forming at least one additional loop, guiding each formed loop over the caught cloth portion and binding of each loop around the caught cloth portion.

6. Forming apparatus, as claimed in claim **4,** in which said means for drawing the loop from said retaining formations and guiding the loop over the caught cloth portion includes a cloth catching member reciprocable longitudinally of said path relative to said rotatable body and carrying said cloth catching needle, said cloth catching member including a hook portion engageable with the rear end of the loop to disengage the loop from said rearwardly facing retaining formations as said retaining member is advanced forwardly along its guiding path, and further including a hook portion on said oscillatable body engageable with the forward end of the loop to draw the loop from the forwardly facing retaining formations during oscillation of said body in one direction and to release the loop for guiding over said oscillatable body and around the caught cloth portion, responsive to oscillation of said oscillatable body in the opposite direction.

7. Forming apparatus, as claimed in claim **6,** in which said tensioning member is an oscillatable link pivotally mounted at one end and having the thread passing aperture at its opposite end.

8. Forming apparatus, as claimed in claim **7,** in which said loop forming means comprises a hook lever pivotally mounted intermediate its ends for pivotal movement across said guiding path, and an oscillatable hook member mounted for oscillation through an arc extending across said guiding path, said hook member having a thread passing aperture therethrough through which the thread is passed in advance of engaging said hook lever.

9. Forming apparatus, as claimed in claim **8,** in which said thread loop retaining member comprises a pair of laterally spaced parallel plates interconnected for conjoint movement along said guiding path; said plates being formed with downwardly and rearwardly sloping bottom surfaces at the forward end of said retaining member; said retaining formations comprising respective forwardly opening notches at the upper ends of said sloping surfaces and respective rearwardly opening notches at the lower ends of said sloping surfaces; said hook lever guiding the thread across the path for engagement with said sloping surfaces and movement into said rearwardly opening notches; said hook member guiding the thread into engagement with said forwardly opening notches and forming a loop retained in said notches; said hook portion of said cloth catching member being enterable between said plates to engage the rear end of the loop retained in said rearwardly facing notches; the hook portion of said oscillatable body being enterable between said plates to engage the forward end of the loop retained in said forwardly opening notches.

10. Forming apparatus, as claimed in claim **9,** including first driving mechanism operable to cyclically reciprocate said thread loop retaining member along its guiding path, to cyclically operate said loop forming means, to cyclically move said tensioning member between its forward and rearward positions, to cyclically oscillate said loop guiding body, and to cyclically operate said loop drawing and guiding means; second driving mechanism operable to cyclically move said cloth catching needle between its open and closed positions and operable to cyclically reciprocate and oscillate said cloth feeding needle; and gearing interconnecting said first and second driving mechanisms and providing a gear ratio therebetween such that the cyclical speed of said first mechanism is equal to the cyclical speed of said second mechanism multiplied by the number of loops bound around each caught cloth portion.

* * * * *