June 6, 1933. E. J. GEARHART 1,912,977

SEMIAUTOMATIC TURFING DEVICE

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Fig. 1.

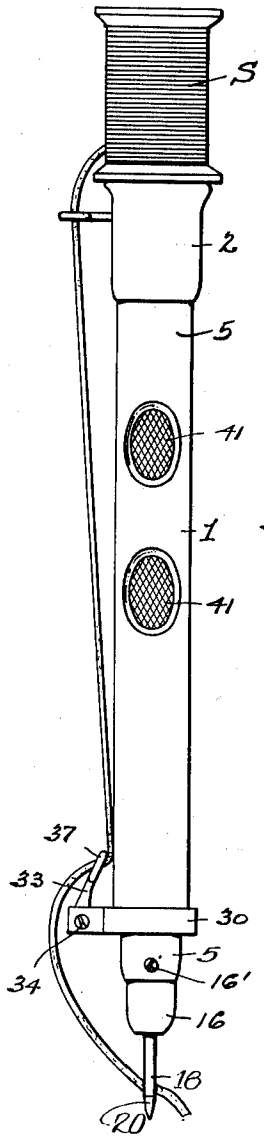


Fig. 7.

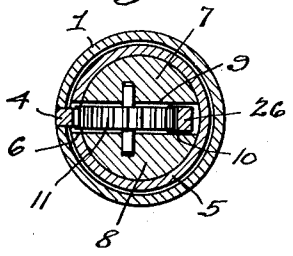


Fig. 8.

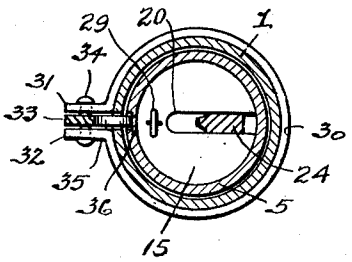


Fig. 9.

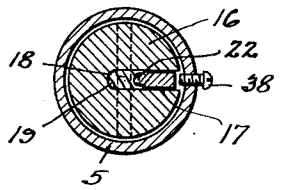
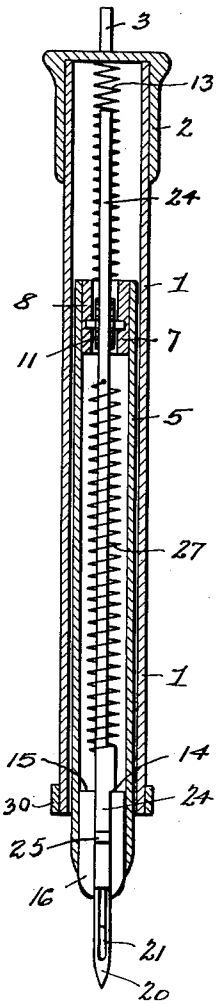


Fig. 10.



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Fig. 2.

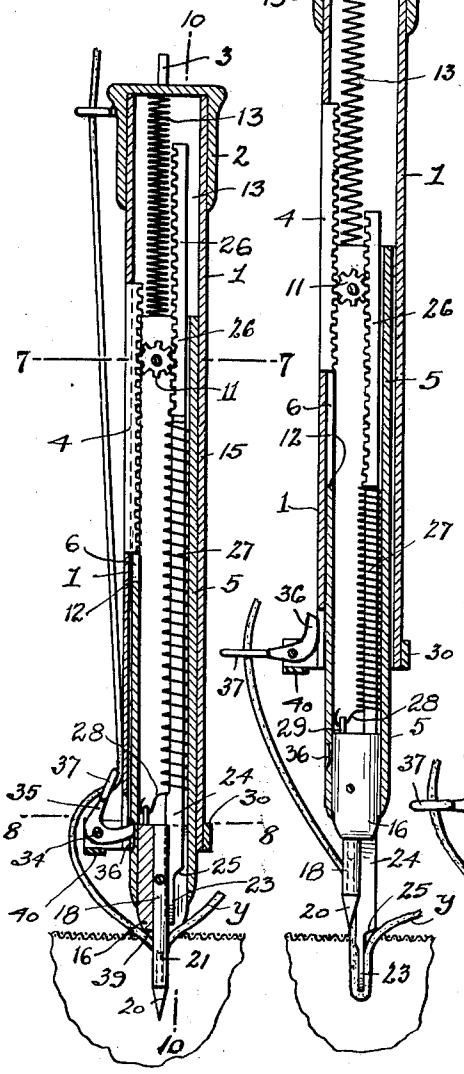


Fig. 4.

Fig. 11.

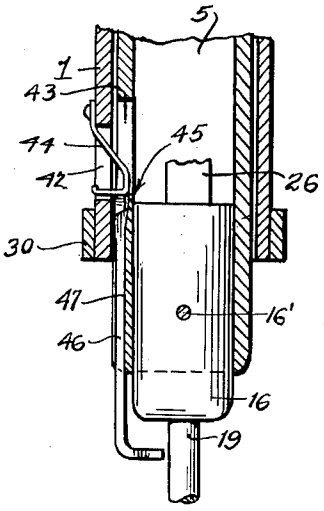


Fig. 5.

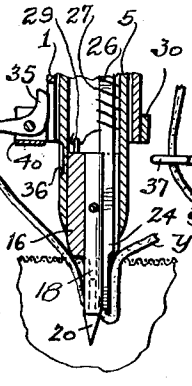


Fig. 6.

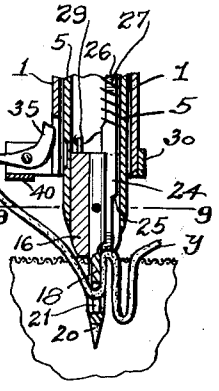
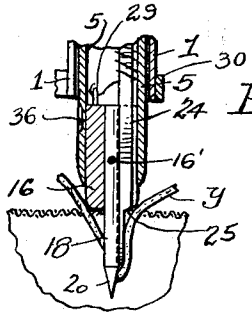


Fig. 3



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UNITED STATES PATENT OFFICE

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SEMIAUTOMATIC TURFING DEVICE

Application filed August 11, 1931. Serial No. 556,452.

The invention forming the subject matter of this application is a turfing device designed to be operated semi-automatically in forming loops of yarn or other material in a base fabric.

The main object of the invention is to provide a device for the purpose described which can be used with very little effort to embroider fabric with designs of all kinds in imitation of the best hand woven tapestry.

Other objects of the invention will become apparent and will in part be pointed out as the detailed description thereof proceeds.

In the drawings:

Figure 1 is a perspective of a preferred embodiment of the invention, in which the device is adapted to carry a spool of silk or yarn to be used in turfing;

Figure 2 is a central longitudinal vertical section through the device showing the several parts in the positions occupied at the start of a turfing operation;

Figure 3 is a fragmentary vertical section showing the turfing elements of the device in the positions occupied at the second stage of operation immediately following that illustrated in Figure 2;

Figure 4 is a section similar to Figure 1 showing the parts relatively positioned at the completion of one looping operation (third stage) with the needle positioned to enter the next hole in the fabric preparatory to the formation of the next loop;

Figure 5 is a similar section showing the parts of the device with the looper element holding a loop in one hole of the fabric while the needle carries the yarn or thread into the next hole preparatory to forming the next succeeding loop;

Figure 6 is a similar section illustrating the looper element withdrawn from the last formed loop, and with all the parts except the locking device occupying the position illustrated in Figure 2;

Figure 7 is a horizontal section taken on the line 7—7 of Figure 2;

Figure 8 is a horizontal section taken on the line 8—8 of Figure 2;

Figure 9 is a horizontal section taken on the line 9—9 of Figure 6;

Figure 10 is a longitudinal vertical section taken on the line 10—10 of Figure 2; and

Figure 11 is a fragmentary sectional detail of a modified form of the invention.

As shown in the drawings, the invention comprises a handle in the form of a tube 1 closed at its upper end by a cap 2 which may be provided with a spindle 3, as shown in Figure 10, to receive spools of material adapted for use in a turfing operation by this device. the tube 1 is slotted between the upper and lower ends thereof to receive a rack 4 which fits tightly in the slot and is brazed or otherwise suitably secured in that slot to the tube 1. The upper end of the rack 4 terminates about one quarter of the length of the tube 1 from the top thereof; while the other end of the rack 4 terminates at about one third of the length of the tube from the bottom thereof. These proportions are not fixed, since they depend upon the size of the device as a whole and the movements of the needle and looper elements in their respective supports.

A second tube 5 slides freely within the tube 1 and is provided with a slot 6 (see Figure 7) which embraces the sides of the rack 4 and is thereby prevented from turning in the tube 1 during their relative sliding movements. The upper end of the tube 5 is provided with two segmental plugs 7 and 8 having their plane faces 9 and 10 in alinement with the edges of the slot 6, and, consequently, in alinement with the opposite sides of the rack 4. A pinion 11 is pivoted in the plugs 7 and 8 and the teeth of this pinion are in mesh with the teeth of the rack 4 when the parts are properly assembled.

The lower end 12 of the slot 6 is adapted to engage the lower end of the rack 4 where it projects into the slot 6 to serve as a stop for limiting the inward movement of the tube 5 within the tube 1. A coil spring 13 is interposed between the inner face of the cap 2 and the top of plugs 7 and 8, flush with the top of the tube 5, and serves yieldingly to resist the inward movement of the tube 5 within the tube 1. The outward movement

of the tube 5 relative to tube 1 is limited by contact of a shoulder 14 (see Fig. 10), formed on the side of a looper element, described hereinafter, with the top 15 of a needle holder 16.

The needle holder 16 is detachably secured in the lower end of the tube 5 by a set screw 16′ (see Figure 1). This holder 16 (see Figure 9) is provided with a radial slot 17; and the slot has the needle 18 suitably secured between the side walls and against the end wall 19 of the slot as by soldering, riveting or brazing. The needle 18 is provided with the usual point 20 for entering the fabric and with the usual eye 21 near the end thereof to receive material, such as yarn or silk, to be used in the turfing operation. The rear wall of the needle is substantially coincident with the axis of the tubes 1 and 5; that is, it is at about the axial center of the needle holder 16. This rear wall of the needle is provided with a groove 22 in which slides the thin rectangular projecting element 23 of a loop bar or looper 24 which is provided at its connection with the element 23 with an inclined shoulder 25.

The looper 24 and element 23 slide freely within the groove 22 of the needle and the looper extends upwardly into the tube 1 to be connected to or formed integral with a rack 26 which also meshes with the pinion 11 carried by the plugs 7 and 8 at the upper end of the tube 5. A tension spring 27 is connected at its upper end to the lower end of the rack 26 and is wound around the looper 24. The spring 27 is provided at its lower end with the hook 28 adapted to engage an eye 29, secured to the upper end of the needle holder 16. It is therefore to be noted here that the hook 28 and the eye 29 are laterally displaced relative to the looper 24. This displacement serves to hold the lower part of the looper in constant sliding contact with the end wall of slot 22 formed in the rear wall of the needle 18.

The outer tube 1 is provided at its lower end with a band 30 which extends around the tube 1 and has its ends spaced apart to form projecting lugs 31 and 32 between which is pivoted a bell crank locking device 33. The device 33 is pivoted at its bend on a pin 34 which extends through the lugs 31 and 32. The arm 35 of the bell crank locking device extends through a slot formed in the lower end of the tube 1 and has the end thereof lying in the path of movement of a locking aperture 36 formed in the inner tube 5.

The locking member 33 is shown in locking position in Figure 2 of the drawings, with the end of the outer arm 37 in contact with the outer tube 1. It will be obvious from the drawings that as the tube 5 slides inwardly in the tube 1 the arm 35 will become disengaged from the locking aperture 36, and the arm 37 will move the arm 35 to a position free of the locking aperture 36 and will permit the tube 5 to slide outwardly in the tube 1. The outer end of the arm 37 is curved to form a loop, adapted to receive the yarn or thread in the manner of the usual tension device common in sewing machines and implements of this kind.

It will be apparent from Figure 9 of the drawings, that the looper 24 has a fair amount of lateral play in the slot 17 of the needle holder so that it may be separated at various slight distances from the needle. The degree of separation of the needle from the looper, after the completion of the looping operation, regulates the distance between adjacent loops and this distance may be controlled by the adjustment of a set screw 38 threaded through the tube 5 and extending into the slot 17 of the needle holder in order to contact with the back of the looper 24 and limit its outward movement relative to the needle 18. By this means the spacing between adjacent loops may be minutely regulated.

In the operation of the device: The parts are locked initially in the relative positions shown in Figure 2. In this position, the eye 21 of the needle 18 is unobstructed and may be readily threaded. The lower end of the looper projection 23 is shown raised clear above the eye 21, and therefore, offers no obstruction to threading. With the parts in this locked position, the needle is forced into the fabric f until the lower end 39 of the needle holder just touches the face of the fabric, which is, of course, assumed to be stretched taut in all directions in a suitable frame.

It will be evident from Figure 1, that if the end 39 of the needle holder 16, which is fixed in the end of tube 5, pressed against the taut fabric, the tube 5 will move further into the tube 1 against the pressure of spring 13. This inward movement of tube 5 will cause anticlockwise rotation of pinion 11 on the fixed rack 4, and will also cause the looper 24 to slide further into the inner tube 5 and move the end of projection 23 still further from the yarn passed through the eye of the needle at the same time the locking aperture 36 moves the arm 35 of the bell crank locking lever 33 until the weight of arm 37 moves the end of arm 35 out of engagement with said aperture. The arm 37 then assumes the horizontal position shown in Figure 6 and rests against the stop 40 to serve as a thread guide.

If now pressure be released from the end of tube 1, with end 39 supported by the taut fabric, the spring 13 will cause tube 1 to rise on tube 5, and in doing so will move rack 4 relative to tube 5. This relative movement causes clockwise rotation of pinion 11, which therefore, slides rack 26 and looper 24 downwardly in the stationary tube 5, and in contact with the back of the needle, into the same hole occupied by said

needle. This movement of the looper along the back of the needle holds the yarn *y* as a loop in the said hole in the manner illustrated in Figure 3.

The movement of the looper along the back of needle 18 continues, with the needle still in the same hole, until the shoulder 25 of the looper contacts with the taut fabric. Then the continued pressure of spring 13 causes the entire tubular structure to rise upwardly on the fabric-supported looper until the point of the needle 18 clears the fabric *f*, as shown in Figure 4. In this position, the thickness of the yarn between the needle and looper causes the needle to be slightly stepped forward from the looper, and this thickness may be used as a gage for automatically determining the separation of the loops in the finished work. However, the operator may swing the device bodily forward on the supporting looper until the back of the looper contacts with the stop screw 38 (see Fig. 9), which may be set as already described, to limit the distance between successive loops in the fabric. A leaf spring can be secured to the inner face of looper 24 to resiliently hold the looper 24 away from needle 19 for the purpose of spacing the loops in the fabric instead of the yarn or thread forcing the looper away from the needle 19 as disclosed in the foregoing paragraph.

From the position, shown in Figure 4, the tubular structure, supported wholly by the shoulder 25 of the looper, is forced toward the fabric until the needle enters the next hole. This downward movement of the needle continues until the end 39 of the needle holder contacts with the fabric *f*. In the meantime the looper remains in the previously formed loop, since it is now the only means for supporting the entire device on the taut fabric. When the end 39 just touches the fabric, the looper and needle are in separate holes in the fabric. Continued pressure on the upper end of the tubular structure then causes withdrawal of the looper until the lower end of the looper projection 23 is well above the eye of the needle and lies in the groove formed in the back of the needle. This final position is shown in Figure 6, and is the same position as the parts shown in Figure 2 occupy immediately after the release of the locking mechanism.

It will be evident from the disclosure so far in this application, that the first half of the looping operation is performed by downward pressure of the hand of the operator on the top of tube 1 of the device. This downward pressure of the hand of the operator stores up energy in the springs 13 and 27 which then automatically perform the other half of the looping operation upon release of pressure on the end of tube 1. The operation of this device is performed by a series of intermittent thrusts toward the fabric, with the return movements effected automatically. This renders the looping a one hand operation, which can be effected very rapidly and without the necessity of the operator actually seeing and selecting the particular holes in the fabric to be looped through. The operator merely guides the device in any desired direction while applying intermittent pressure on the end thereof, and can perform the looping operation practically as fast as a machine can stitch.

Where the base fabric is very fine it may be necessary to prevent relative sliding movements of the tubes 1 and 5 until the needle shall have fully entered the fabric. For this purpose the outer tube 1 may be provided with any desired number of bevel edged apertures 41 conveniently arranged and designed to permit the thumb or fingers of the operator to engage both tubes and hold them resiliently together until the needle has fully pierced the fabric.

This function may also be performed by providing the outer tube 1 with a slot 42 adapted to register with a slot 43 formed in the inner tube 5; a leaf spring 44 has one end secured to the tube 1 and has the body thereof bent through the slot 42 to enter the slot 43 and engage the end 45 of slot 43 to form a positive lock for moving the tube 5 downwardly with tube 1. In order to release the tube 5 from tube 1, a trip rod 46 is slidably mounted in a groove 47 formed in tube 5; and the lower end of this trip rod is bent and bifurcated to project below the lower end of the needle holder 16 so as to contact with the fabric slightly in advance of said lower end and trip the spring 44 to permit the tube 5 to slide inwardly of the tube 1 as the end of holder 16 is pressed against the fabric. The operation of this locking mechanism will be obvious from inspection of Figure 11 of the drawings.

Strictly speaking, the needle of this device is the "looper" since the needle forms the loop. However, the loop bar 24 is commonly referred to in this art as a "looper". The loop bar or looper does not form the loop, it merely holds the loop after it has been formed by the needle. It is therefore, to be understood that wherever the term "looper" is used in the specification and claims that it does not refer to the needle but does refer to the loop holder or loop bar 24.

While I have described my invention as embodied in concrete form and as operating in a specific manner in accordance with the provisions of the patent statutes, it should be understood that I do not limit my invention thereto, since various modifications thereof will suggest themselves to those skilled in the art without departing from

the spirit of my invention, the scope of which is set forth in the annexed claims.

What I claim is:

1. In a turfing device, a handle, a rack secured to said handle, a needle holder reciprocably mounted in said handle and having a needle projecting from one end thereof, a pinion journaled on said needle holder and meshing with said rack, a loop bar reciprocably mounted in said handle and having a rack meshing with said pinion, and yielding means for moving the needle holder in one direction in said handle.

2. In a turfing device, a handle having a rack secured thereto, a needle holder reciprocable relative to said handle and having a needle projecting from one end thereof, a pinion rotatable on said needle holder and meshing with said rack, a loop bar reciprocable independently of said needle holder relative to said handle, a rack secured to said loop bar and meshing with said pinion, and a spring engaging said holder to maintain the holder and loop bar normally projecting from said handle.

3. A turfing device comprising a tube, a rack secured to a wall of said tube and parallel to the axis thereof, a needle holder provided with a slot to slide along said rack, a pinion journaled on said needle holder and meshing with said rack, a loop bar slidable in said tube independently of said needle holder and having a rack meshing with said pinion, a spring engaging the inner end of said needle holder to maintain the holder normally projecting from said tube, and yielding means for holding the loop bar in sliding contact with said needle.

4. A turfing device comprising a handle formed as a tube, a rack secured to the wall of said tube parallel to the axis thereof, a needle holder mounted to slide in said tube and having a needle projecting from one end thereof, a loop bar slidably mounted in said tube independently of the needle holder and having a rack secured thereto, a pinion rotatably mounted on said needle holder and meshing with each of said racks, yielding means engaging the inner end of the needle holder for maintaining the needle holder and loop bar normally projected from one end of said tube, and locking means engageable with said needle holder when retracted in predetermined position within said tube to lock the needle holder and loop bar retracted within said tube.

5. The combination set forth in claim 4 of means for holding said loop bar in yielding sliding contact with said needle.

6. The combination set forth in claim 4 of a spring having one end secured to said needle holder and the other end to said loop bar to hold the loop bar and needle in sliding contact with each other.

7. A turfing device comprising a handle having a rack fixed thereto, a needle holder and a loop bar reciprocable independently of each other within said handle, a needle fixed to said holder, said loop bar having a rack secured thereto, a pinion meshing with each of said racks and rotatably mounted on said holder, a spring in said handle engaging one end of the needle holder, means for holding the loop bar in sliding contact with said needle, said loop bar having a shoulder adapted to rest on the fabric being turfed to support the needle elevated above said fabric, and means rotatably mounted on said handle for locking the needle holder and loop bar in a predetermined position on said handle.

8. In a fabric turfing device; a needle holder having a needle projecting from one end thereof; a handle mounted to reciprocate on said holder; a loop bar reciprocable in said handle and in sliding contact with said needle; and means on said holder, handle and loop bar, operated by the reciprocation of the handle on said holder, for reciprocating the loop bar along the needle in the directions opposite to the directions of reciprocation of the handle on said holder.

9. In a fabric turfing device; a needle holder having a needle projecting from one end thereof; a handle mounted to reciprocate on said holder; a loop bar reciprocable in said handle and in sliding contact with said needle; yielding means for moving the handle in one direction on said holder, said handle being movable in the opposite direction manually; and means on said holder, handle and loop bar operated by the reciprocation of the handle on said holder, for reciprocating the loop bar along the needle in the directions opposite to the directions of reciprocation of the handle on said holder.

10. In a fabric turfing device; a needle holder having a needle projecting from one end thereof; a handle mounted to reciprocate on said holder; a loop bar reciprocable in said handle and in sliding contact with said needle; means for automatically moving the handle in one direction on said holder; yielding means connecting the loop bar to said holder and acting in opposition to the first named means; and means on said holder, handle and loop bar, operated by the reciprocation of the handle on said holder for reciprocating the loop bar along the needle in the directions opposite to the directions of reciprocation of the handle on said holder.

11. In a fabric turfing device; a needle holder having a needle projecting from one end thereof; a handle mounted to reciprocate on said holder, a loop bar reciprocable in said handle and in sliding contact with said needle, yielding means connecting said handle and loop bar to said holder for automatically sliding said handle and loop bar in oppo-

site directions relative to said holder, and means on said holder, handle and loop bar, operated by the reciprocation of the handle on said holder, for reciprocating the loop bar along the needle in the directions opposite to the directions of reciprocation of the handle on said holder.

In testimony whereof I affix my signature.

EMORY J. GEARHART.