(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 122 690**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **84300883.0**

(22) Date of filing: **13.02.84**

(51) Int. Cl.³: **D 05 B 29/00**
D 05 B 53/00, D 05 C 7/08

(30) Priority: **12.02.83 GB 8303958**

(43) Date of publication of application:
24.10.84 Bulletin 84/43

(84) Designated Contracting States:
DE FR GB IT

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(54) **Sewing machine.**

(57) A sewing machine, especially a multi-head machine used for decorative embroidery, is provided with a presser foot (7), through which the sewing needle (6) passes, having two parts (140 and 141) spring-biased together to trap an auxiliary decorative thread between them. The thread is released when an upper arm (15) of one of the two parts impinges on a stop (4*a*) during the upward stroke of the needle and presser foot, and this permits the formation of a loop as the presser foot again descends, gripping the thread. The loops aree secured to the fabric by stitches formed in the main thread. Any stations of a multi-head machine can be modified in this way without altering the performance of any other station.

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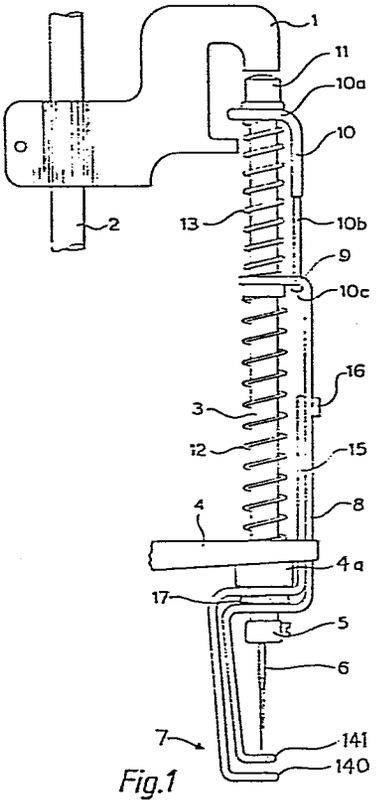

Fig.1

SEWING MACHINE

This invention relates to sewing machines, particularly of the type capable of decorative embroidery, in which an auxiliary thread is supplied to the needle to be attached by the main sewing thread to the work piece.

In a known machine of this type, the auxiliary thread is sewn flat to provide a bold line in an embroidery pattern. In another machine, the auxiliary thread is subjected to a positive feeding action so as to be formed into loops attached to the workpiece at only one portion of each loop so as to form a looped pile embroidery. The looped pile produces a desirable decorative effect enabling large areas of pattern to be filled in relatively quickly. A problem with the known machine is that control of the formation of the loops is difficult because of the problems of coordinating the positive feeding action of the thread to the rate of progress of the needle across the workpiece. Satisfactory loop formation is not guaranteed.

EP-O 059 292A discloses a sewing machine having an auxiliary presser foot used in conjunction with the main presser foot to grip and release the auxiliary thread to form loops. The movement of the auxiliary presser foot is controlled by micro-rams set in the adjacent station of the machine. This not only requires accurate control of the rams but also reduces the working capcity and flexibility of multi-needle machines.

According to the present invention, a sewing machine comprising a reciprocable sewing needle adapted to carry a main thread, a presser foot reciprocable with the needle into and out of contact with the fabric to be sewn, and supply means for supplying an auxiliary thread to the presser foot, is characterised in that the presser foot comprises first and second relatively movable parts spring biased together so as to restrain the passage of the auxiliary thread therebetween, the parts being separable, thereby freeing the passage of the auxiliary thread there-

between, by engagement with stop means during movement of the presser foot away from the fabric.

Preferably, the needle is mounted on a vertical rod which is slidably-mounted in a support, said means for reciprocating the needle comprising a vertically reciprocating actuating arm which engages the rod on the downward stroke of the arm, and spring means are provided for biasing the rod and the presser foot upwardly away from the fabric, and the machine is characterised in that each part of the presser foot comprises a mounting arm slidably-mounted on the rod, a compression spring extends between adjacent portions of the mounting arms to bias the first part into contact with the second part, and the support carries a stop engageable by the mounting arm of the first part as the rod is moved upwardly, engagement of the stop by the said first part serving to compress the compression spring, thereby separating the two parts of the presser foot to allow the auxiliary thread to move freely therebetween.

In a preferred embodiment, the spring means comprise a first compression spring surrounding said rod and extending between the support and an upper portion of the mounting arm of the first part of the presser foot, a guide arm having an upper end slidably mounted on the rod and a lower end portion passing through the upper portion of said mounting arm and having a retaining head thereon, said guide arm being retained on said rod by an enlarged head portion of said rod, and a second compression spring, less readily compressible than the first spring, extending between the upper portion of said mounting arm and the upper end of the guide arm.

Reference is made to the drawings, which show a portion of a sewing machine in accordance with one exemplary embodiment of the invention, and in which :

Figure 1 is a side elevation of the reciprocating needle and presser foot assembly of the machine; and

Figures 2, 3 and 4 show the lower portion of the

assembly at three successive stages in the formation of one loop in the auxiliary thread.

In one form of standard multi-needle embroidery sewing machine, for example that sold by Barudan Co. Limited, of Japan under the designation BEJM/UF/8-12, a plurality of reciprocable needle and presser foot assemblies are provided, selectively drivable by means of an actuating arm 1, as shown in Figure 1, attached to a vertically reciprocating drive shaft 2 which may be rotated about the longitudinal axis thereof so that the actuating arm 1 can engage any selected one of the assemblies.

Each assembly, Figure 1 showing one example thereof, comprises a vertical slide rod 3 slidably mounted in a supporting bracket 4 and carrying at the lower end thereof a needle clamp 5 holding the sewing needle 6. The presser foot 7 is mounted so as to reciprocate with the needle and comprises two relatively movable parts 140 and 141, the second part 141 having an upwardly extending arm 8 terminating at an intermediate point on the slide rod 3 with a portion 9 through which the rod passes. A slide arm 10 extends between the portion 9 and the upper end 11 of the slide rod 3. The slide arm 10 has a portion 10a which is attached to the upper end 11 and a downwardly extending portion 10b which passes slidably through the portion 9 of the arm 8, but has a retaining head 10c on the lowermost end thereof to prevent separation from the arm 8. A first helical spring 12 extends between the supporting bracket 4 and the portion 9 of the arm 8, surrounding the slide rod 3. A second helical spring 13 surrounds the slide rod 3 and extends between the portion 9 and the portion 10a of the slide arm 10. The first spring is more readily compressible than the second spring, so that when the upper end 11 of the rod 3 is pressed downwardly, the presser foot 7 moves with the rod until it meets the fabric on the bed of the machine. The second spring then compresses enabling the needle to be

driven downwardly through the workpiece.

The first part 140 of the presser foot 7 is mounted adjacent to the second part 141 and externally thereof. The first part 140 of the presser foot 7 has an upper arm 15 which passes slidably through the bracket 4 and is slidably secured to the arm 8 by means of a screw 16 passing through a vertical elongate slot (not shown) in the arm 8. The first part 140 is therefore movable relative to the second part 141. A third helical spring 17 surrounds the slide rod 3 between the arms of the two parts of the presser foot which surround the rod 3. In the position illustrated by Figure 1, this spring 17 is fully compressed.

In use, referring the Figures 2 to 4, the main thread 20 passes through the needle and into the workpiece 21 in conventional manner. An auxiliary thread 22 is passed under the second part 141 of the presser foot 7 and through the needle hole in the first part 140 of the presser foot. The auxiliary thread may be a relatively thick thread, compared with the main thread, such as a braided thread or even a twisted woollen yarn. Since the auxiliary thread 22 passes through the needle hole in the first part 140, as a stitch is formed by the main thread, the stitch passes through the auxiliary thread, thus holding it to the workpiece 21. Figure 2 shows the needle and presser foot assembly at its uppermost point. A gap exists between the two parts 140 and 141 of the presser foot 7.

Figure 3 shows the commencement of the downward stroke of the slide rod 3. The second part 141 of the presser foot has begun to move downwardly, but the needle 6 has not yet moved relative to that part 141. The third spring 17 urges the first part 140 of the presser foot upwardly and this causes the portions surrounding the needle holes to close together, thus gripping the auxiliary thread between then. The workpiece is moved forward by the machine, and continued downward movement of

the slide rod 3 carries the gripped portion of the auxiliary thread 22 back down on to the workpiece 21, where further movement of the slide rod 3 drives the needle downwardly through the auxiliary thread 22, thus stitching it to the workpiece 21, using the main thread 20. The spring 17 is arranged to have sufficient force to retain the thread during the downward movement, but to allow the auxiliary thread to be drawn through the presser foot 7 during the return upward movement thereof towards the position shown in Figure 2. Also since the first part 140 of the presser foot is drawn upwardly again by the second part 141, via the third helical spring 17, this spring will also tend to recompress and this causes separation of the portions of the feet surrounding the needle holes. The separation allows the auxiliary thread to pass through more easily in forming a further loop.

It will be apparent that each needle and presser foot assembly of a multi-needle machine may be provided with a presser foot assembly as described above, and that the provision of the presser foot assembly will not impede normal operation of that assembly when the auxiliary thread is not present. Thus, the capacity of the machine to change from one type of thread or colour of thread to another readily during an embroidering operation will not be affected, and different colours or types of looped pile embroidery as produced by the machine in accordance with the present invention can be carried out by such a multi-needle machine.

CLAIMS

1. A sewing machine, comprising a reciprocable sewing needle (6) adapted to carry a main thread, a presser foot reciprocable with the needle into and out of contact with the fabric to be sewn, and supply means for supplying an auxiliary thread to the presser foot, characterised in that the presser foot comprises first and second relatively movable parts (7 and 14) spring-biassed together so as to restrain the passage of the auxiliary thread therebetween, the parts being separable, thereby freeing the passage of the auxiliary thread therebetween, by engagement with stop means (4) during movement of the presser foot away from the fabric.

2. A sewing machine according to Claim 1, wherein the needle (6) is mounted on a vertical rod (3) which is slidably-mounted in a support (4), said means for reciprocating the needle comprising a vertically reciprocating actuating arm (1) which engages the rod on the downward stroke of the arm, and spring means are provided for biassing the rod and the presser foot upwardly away from the fabric, characterised in that each part of the presser foot comprises a mounting arm slidably-mounted on the rod, a compression spring (17) extends between adjacent portions of the mounting arms to bias the first part into contact with the second part, and the support carries a stop (4a) engageable by the mounting arm of the first part as the rod is moved upwardly, engagement of the stop by the said first part serving to compress the compression spring, thereby separating the two parts of the presser foot to allow the auxiliary thread to move freely therebetween.

3. A sewing machine according to Claim 2, characterised in that the spring means comprise a first compression spring (12) surrounding said rod and extending between the support (4) and an upper portion (9) of the mounting arm (8) of the first part of the presser foot, a guide arm

(10) having an upper end (10a) slidably mounted on the rod (3) and a lower end portion (10b) passing through the upper portion (9) of said mounting arm (8) and having a retaining head (10c) thereon, said guide arm being retained on said rod by an enlarged head portion (11) of said rod, and a second compression spring (13), less readily compressible than the first spring (12), extending between the upper portion (9) of said mounting arm and the upper end (10a) of the guide arm.

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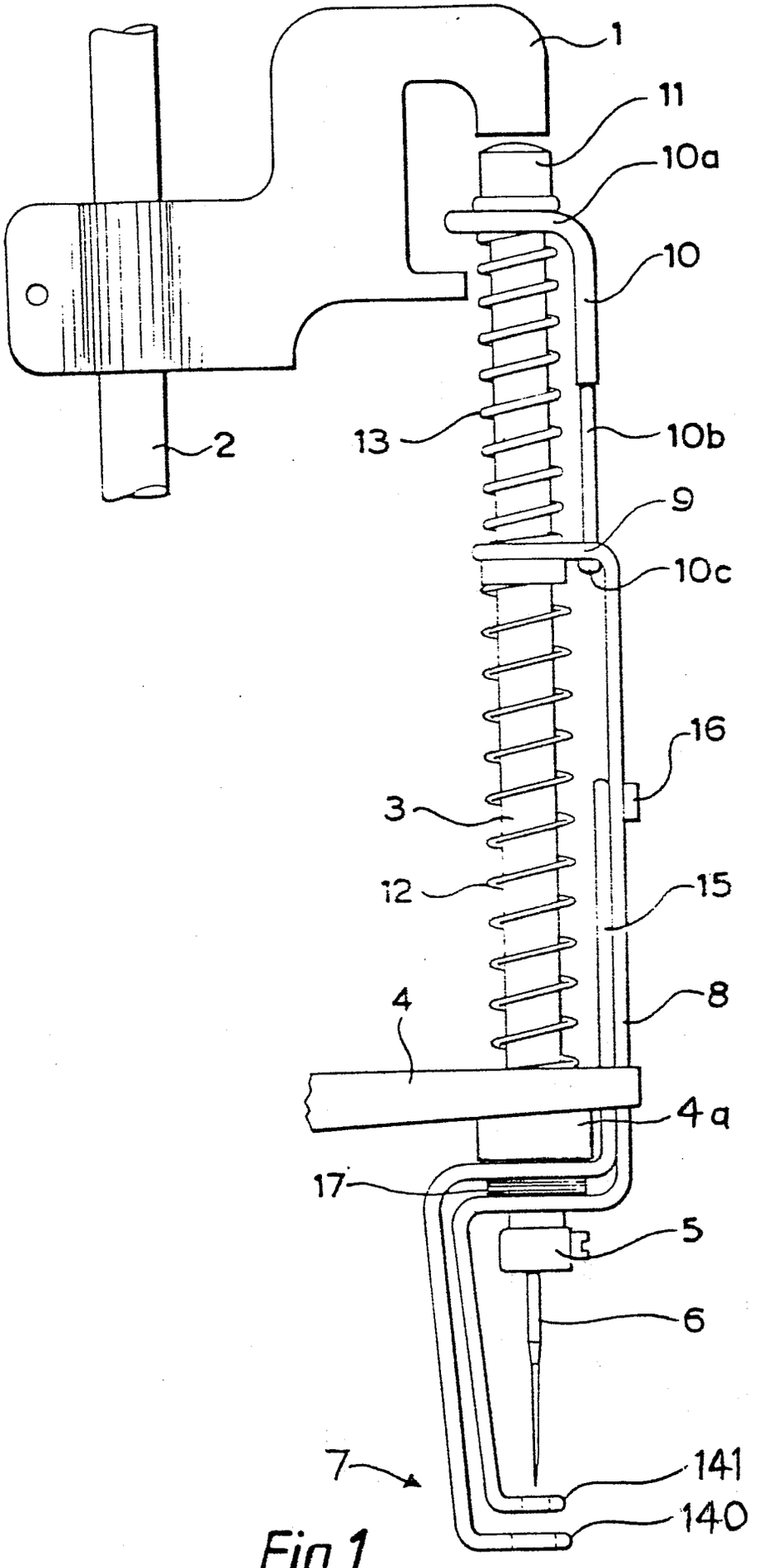

Fig.1

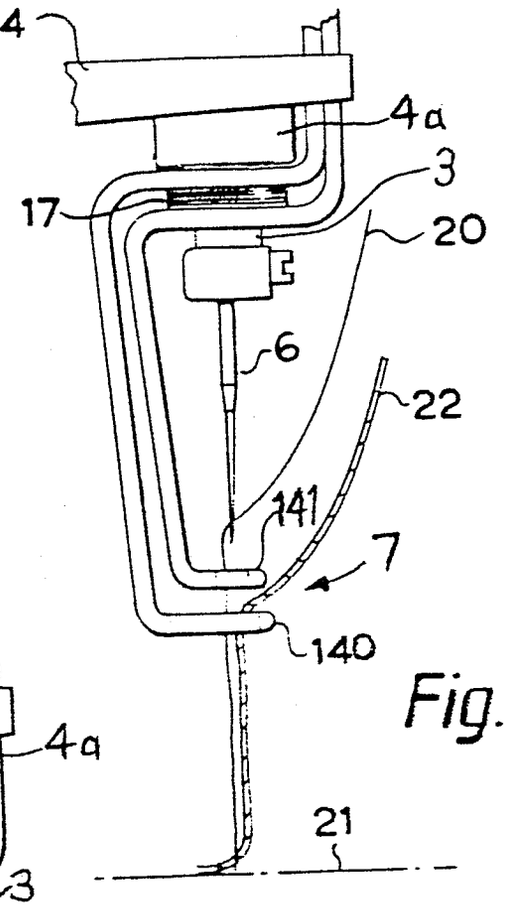

Fig. 2

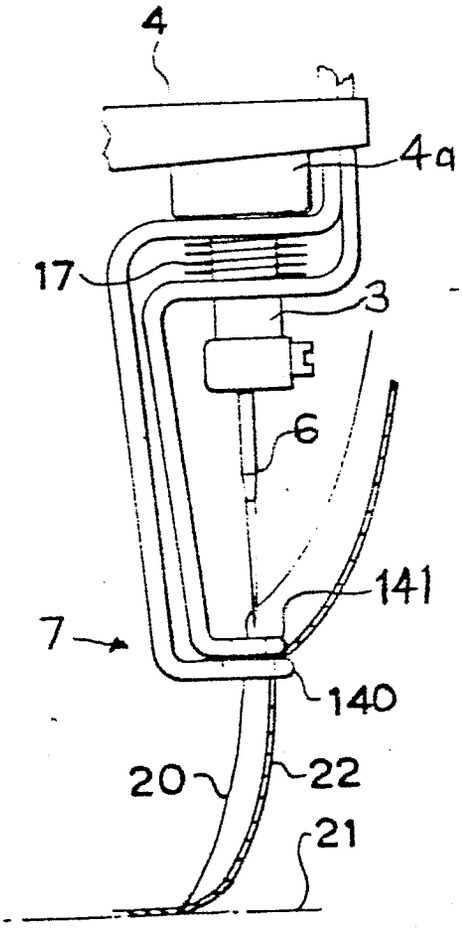

Fig. 3

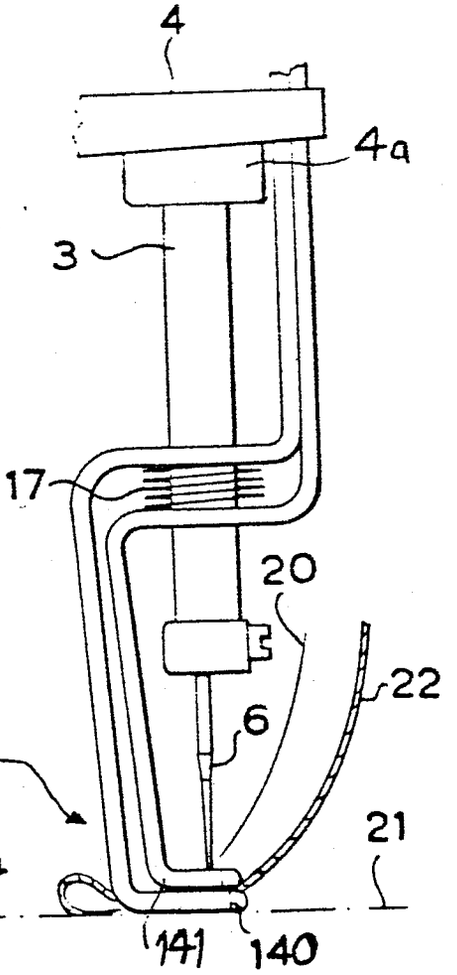

Fig. 4

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EUROPEAN SEARCH REPORT

0122690
Application number

EP 84 30 0883

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
D,A	EP-A-0 059 292 (MESNIL)		D 05 B 29/00 D 05 B 53/00 D 05 C 7/08
A	DE-C- 142 840 (LINTZ) * Figures, ref. a,b *	1	
A	FR-A-1 028 003 (PRAZAK) * Figure 1, ref. 29,30,31 *	1	
A	US-A-1 739 397 (JOHNSON) * Figure 4 *	1	
A	BE-A- 836 912 (DEYART) * Figure 2 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

D 05 B
D 05 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	15-06-1984	VUILLEMIN L.F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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