

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 967 310 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
29.12.1999 Bulletin 1999/52

(51) Int. Cl.⁶: **D02J 13/00**, D02J 1/22,
D02G 1/00, B65H 57/00

(21) Application number: **98830384.8**

(22) Date of filing: **26.06.1998**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventors:
• **Bartagnolio, Franco**
20125 Milano (IT)
• **Cogo, Mauro**
23814 Cassina Valsassina (Lecco) (IT)

(71) Applicant:
Officine Meccaniche Riva S.r.l.
22048 Oggiono (Lecco) (IT)

(74) Representative:
De Nova, Roberto et al
c/o **JACOBACCI & PERANI S.p.A.**
Via Visconti di Modrone 7
20122 Milano (IT)

(54) Texturing machine and texturing process

(57) A texturing machine (1) of the type comprising in a frame (2) a yarn path (3) for a yarn (F), running between a feeder on the creel side (4) and a feeder on the collection side (5), together with a heater (6) and a cooler (7) disposed in succession along the said yarn path (3), in which the cooler (7) comprises a guide (8)

for the yarn (F) and at least one Peltier element (16) associated with the guide (8) and having a cold surface (17) facing the yarn path (3), provides the advantage of a substantially rectilinear yarn path whose length is exceptionally small.

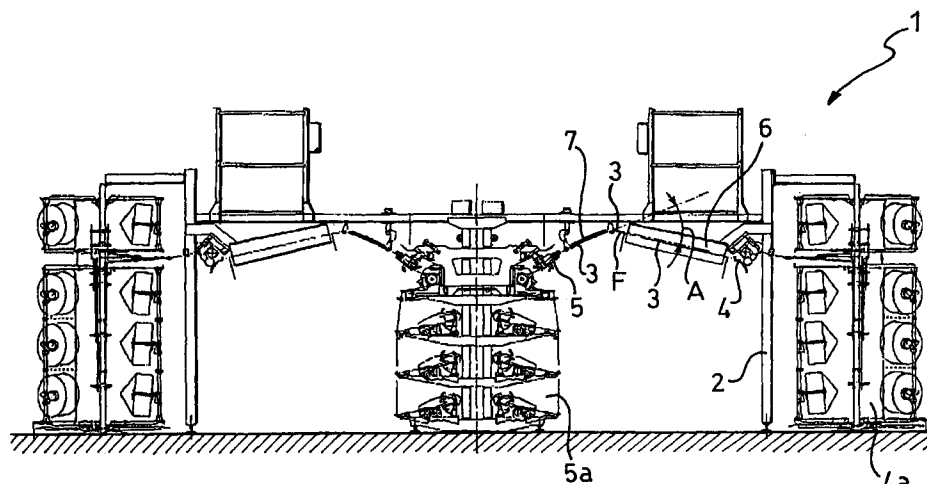


FIG.1

EP 0 967 310 A1

Description

[0001] The present invention relates to a texturing machine of the type comprising in a frame a yarn path for a yarn to be textured, running between a feeder on the creel side and a feeder on the collection side, together with a heater and a cooler disposed along the said yarn path.

[0002] The present invention also relates to a process for texturing a yarn, and in particular a process for cooling the yarn.

[0003] As is known, it is necessary to subject the yarn in the course of texturing to a heating process followed by a cooling process.

[0004] For this purpose, known texturing machines are provided with heaters and coolers which extend at a very small acute angle, forming an inverted V.

[0005] These texturing machines, although satisfactory in some ways and extensively used, have a recognized disadvantage which is manifested between the heater and the cooler, when the yarn is compelled to pass through a sharp angle along its path. At this sharp angle there is a change of direction in the path of the yarn, resulting in a completely unnecessary stress on the yarn.

[0006] Texturing machines in which the heater and cooler are disposed substantially in alignment have been proposed. This solution, although on the one hand it eliminates the aforementioned disadvantage, encounters the problem of a prohibitive increase in the overall dimensions of the machine in respect of either the elevation or the plan.

[0007] The problem addressed by the present invention is that of devising a texturing machine which has structural and functional characteristics such that the aforesaid disadvantages can be overcome.

[0008] This problem is resolved by a texturing machine of the specified type, which is characterized in that the cooler comprises a guide for the yarn, running along the said yarn path, and at least one Peltier element associated with the said guide and having a cold surface facing the said yarn path.

[0009] Further characteristics and advantages of the texturing machine according to the present invention will be made clear by the following description of one embodiment of it, provided by way of example and without restriction, with reference to the attached figures, in which:

- Figure 1 shows a schematic view in elevation of a texturing machine according to the invention;
- Figure 2 shows a view in elevation and on an enlarged scale of one detail of a texturing machine shown in Figure 1;
- Figures 3 and 4 show transverse sectional views of the detail shown in Figure 2, taken along the lines III-III and IV-IV respectively;
- Figure 5 shows a schematic view of another detail

of the texturing machine shown in Figure 1;

- Figure 6 shows a view in elevation and on an enlarged scale of one detail of the machine shown in Figure 1, according to a variant embodiment;
- Figure 7 shows a view of the detail shown in Figure 6, in the direction of the arrow VII;
- Figures 8 and 9 show transverse sectional views of the detail shown in Figure 6, taken along the lines VIII-VIII and IX-IX respectively;
- Figure 10 shows a view in elevation and on an enlarged scale of one detail of the machine shown in Figure 1, according to a further variant embodiment; and
- Figures 11 and 12 show transverse sectional views of the detail shown in Figure 10, taken along the lines XI-XI and XII-XII.

[0010] With reference to the attached figures, the number 1 indicates a texturing machine as a whole. The texturing machine 1 is designed to texture a yarn F, and comprises, in a frame 2, a yarn path 3 for the yarn F to be textured. The yarn is a synthetic yarn, for example one made from nylon, polyester or similar.

[0011] The yarn path 3 runs between a feeder 4 which is disposed on the side nearer a creel 4a, and a feeder 5 which is disposed on the side nearer a collector 5a.

[0012] A heater 6 and a cooler 7 are disposed along the yarn path 3.

[0013] The cooler 7 and the heater 6 are disposed substantially in alignment, or, more precisely, with the heater rising slightly and with the cooler descending slightly. In this way the yarn path 3, in passing from the heater 6 to the cooler 7, undergoes a change of direction whose angle A is very small.

[0014] According to the present invention, the cooler 7 comprises a guide 8, in the form of an elongate and slightly curved member, having an outer curved surface 9 facing upwards and an inner curved surface 10 facing downwards. In general, the guide 8 is made from aluminium, preferably from aluminium section, and has a titanium oxide coating.

[0015] The outer curved surface 9 has the yarn F passing over it, and thus forms by its conformation the part of the yarn path affected by the cooling.

[0016] The guide 8, which in the example has a length of 460 mm, is substantially in the form of a plate and has on the outer curved surface 9 two fins, both indicated by 11, substantially forming a V, within which and at the base of which the yarn F travels along its path.

[0017] On the inner curved surface 10, the guide 8 is advantageously provided with a heat sink 12, which is formed by an aluminium section 13 having a base 14 and finning 15 for dissipating the heat.

[0018] Three Peltier elements, all indicated by 16, are fixed to the guide 8 on its inner curved surface 10, and are interposed between the guide 8 and the base 14 of the aluminium section 13. Each Peltier element 16 comprises a cold surface 17 facing the said yarn path 3 and

a hot surface 18 facing the heat sink 12. In particular, each Peltier element is housed in a corresponding recess 16a formed in the inner curved surface 10.

[0019] An electrical circuit 19 supplies each Peltier element 16 with an electrical current at a predetermined voltage, which can be adjusted by regulating means, in the form of a rheostat 19b, between a minimum value and a maximum value. The electrical circuit 19, which is of a known type, is completed by a transformer 19c, a rectifier 19d and a capacitor 19e.

[0020] The direction of the current passing through the Peltier element is selected in such a way that the cold surface faces the path and its hot surface faces the heat sink.

[0021] The Peltier element is of a known type and is available commercially. In the example, a Peltier element marketed by the company iTi Ferrotec - International Thermoelectric, Inc. under the trade name Thermo Module and the symbol 6300/071/060/A was used. This element is substantially plate-shaped and has dimensions of approximately 30 mm × 30 mm and a thickness of approximately 4 mm.

[0022] Preferably, the Peltier elements 16 are disposed along the guide 8 with a non-uniform distribution and in particular with a localized clustering at a point P of the guide 8 preferably corresponding to the centre of the guide.

[0023] In one example of operation, a yarn having a count of 75 dtex was processed, with a production rate of 1000 m per minute. The power supply voltage was set at four volts. It was found that when the yarn temperature on exit from the heater was 162° the yarn temperature on exit from the cooler was 62°.

[0024] In a second example of operation, a yarn of 167 dtex was processed, with a production rate of 900 m per minute, and with a power supply voltage of 2 to 6 volts. The following results were obtained: for a yarn having a temperature of 141° on exit from the oven, the yarn temperatures on exit from the cooler were found to be 80°, 75°, 71° and 70° for Peltier element supply voltages of 2, 3, 4 and 5 volts respectively.

[0025] The best results were obtained with the Peltier elements supplied at 4 volts, since saturation of the Peltier elements occurred at higher voltages, owing to the insufficient capacity of the heat sink to dissipate the heat and the onset of the predominance of heating due to the Ohm effect.

[0026] It should be noted that the total power consumption of the Peltier elements is approximately 60 watts, with a power supply at 4 volts, and that the temperature of the cooler is maintained at approximately 30°C at the most critical point, in other words at the leading end. In these conditions, the heat sink shows an improved efficiency.

[0027] With reference to Figures 6-9, a cooler 30 is shown according to a variant embodiment in which the parts structurally and functionally equivalent to those of the cooler 7 are represented by the same reference

numbers and are not described in the following text. In the cooler 30 there is a duct 31, running along the heat sink 12 and surrounding the finning 15, a current of air 32 being established along the said duct 31 by means of a fan 33.

[0028] With reference to Figures 10-12, a cooler 40 is shown according to a variant embodiment of the coolers 7 and 30. In the cooler 40 the parts which are structurally and functionally equivalent to those of the coolers 7 and 30 are represented by the same reference numbers.

[0029] The cooler 40 is slightly curved and has its outer curved surface facing downwards and the inner curved surface facing upwards. In these conditions, the heat sink shows an improved efficiency, since the air which passes over the fins is caused, by upward convective motion, to move spontaneously away from the said heat sink.

[0030] According to another aspect of the said invention, a process of texturing a yarn comprises the phase of cooling a yarn along a path from the exit of a heater, following the placing of a cold surface 17 of a Peltier element 16 facing the said yarn path 3.

[0031] The principal advantage of the texturing machine and of the texturing process according to the present invention lies in the fact that the yarn path is substantially rectilinear and the yarn passes from the heater to the cooler in substantial alignment. Additionally, the length of the cooler is exceptionally small, enabling compact overall dimensions to be achieved.

[0032] A further advantage of the texturing machine and of the texturing process according to the present invention lies in the fact that the cooling imparted to the yarn by the cooler is adjustable as required from a minimum to a maximum, and during the texturing if necessary, thus providing a high degree of versatility of the machine, which can thus process yarns of various dimensions and various materials, together with an optimization of the process for any given type of yarn.

[0033] A further advantage of the texturing machine and of the texturing process according to the present invention lies in its reliability, which is achieved by the fact that they make use of components, such as the Peltier elements, which have no moving parts and which therefore have a service life which is unlimited, or in any case is such as to guarantee operation throughout the working life of the texturing machine.

[0034] A further advantage of the invention lies in the fact that it is favourable from the ecological, environmental and noise-reduction viewpoints, since it uses highly environment-friendly elements, such as the Peltier elements.

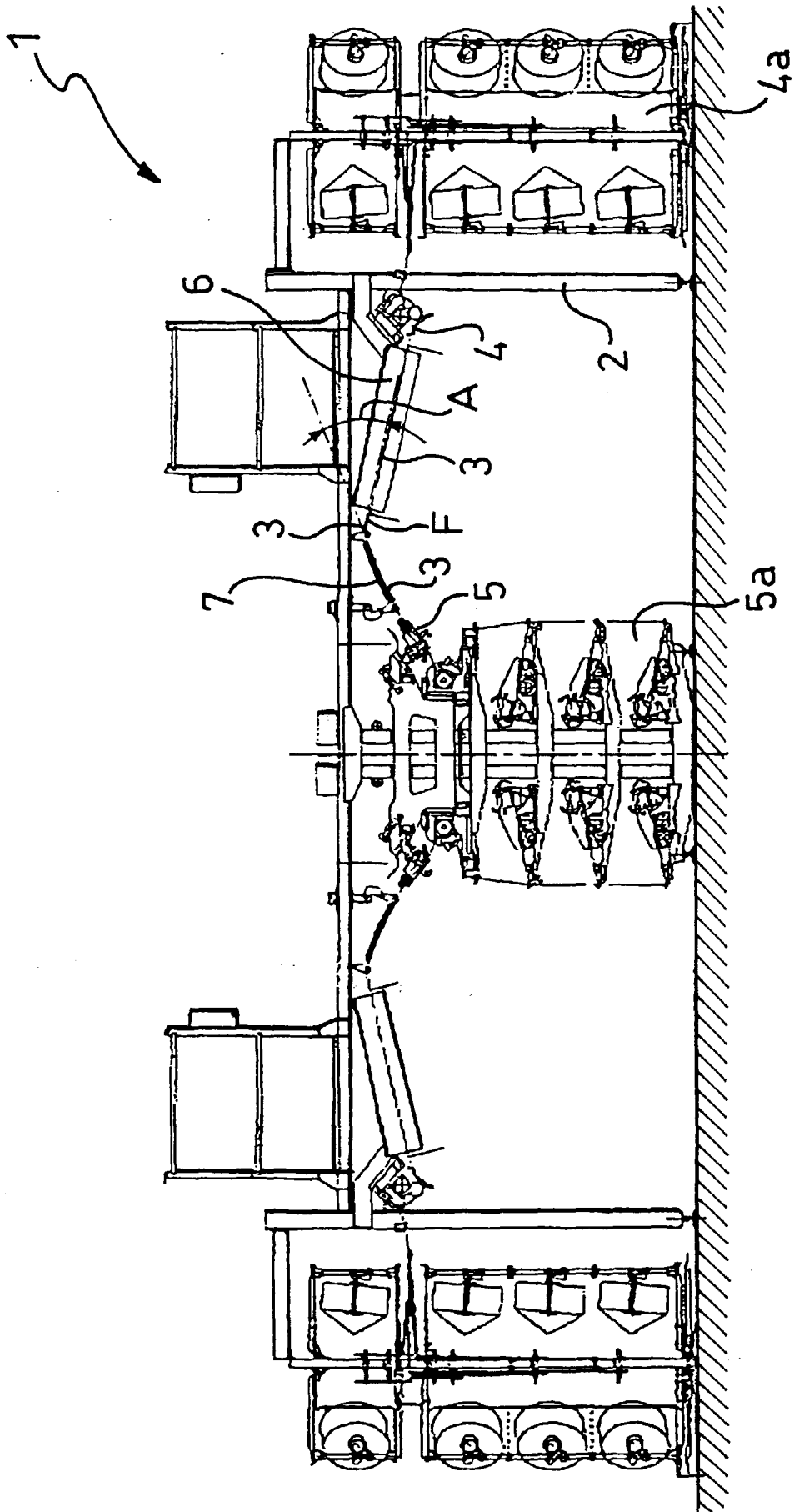
[0035] Clearly, a person skilled in the art will be able to make numerous modifications and changes to the texturing machine and of the process described above, in order to meet contingent and specific requirements, all such modifications and changes being contained within the scope of protection of the invention, as

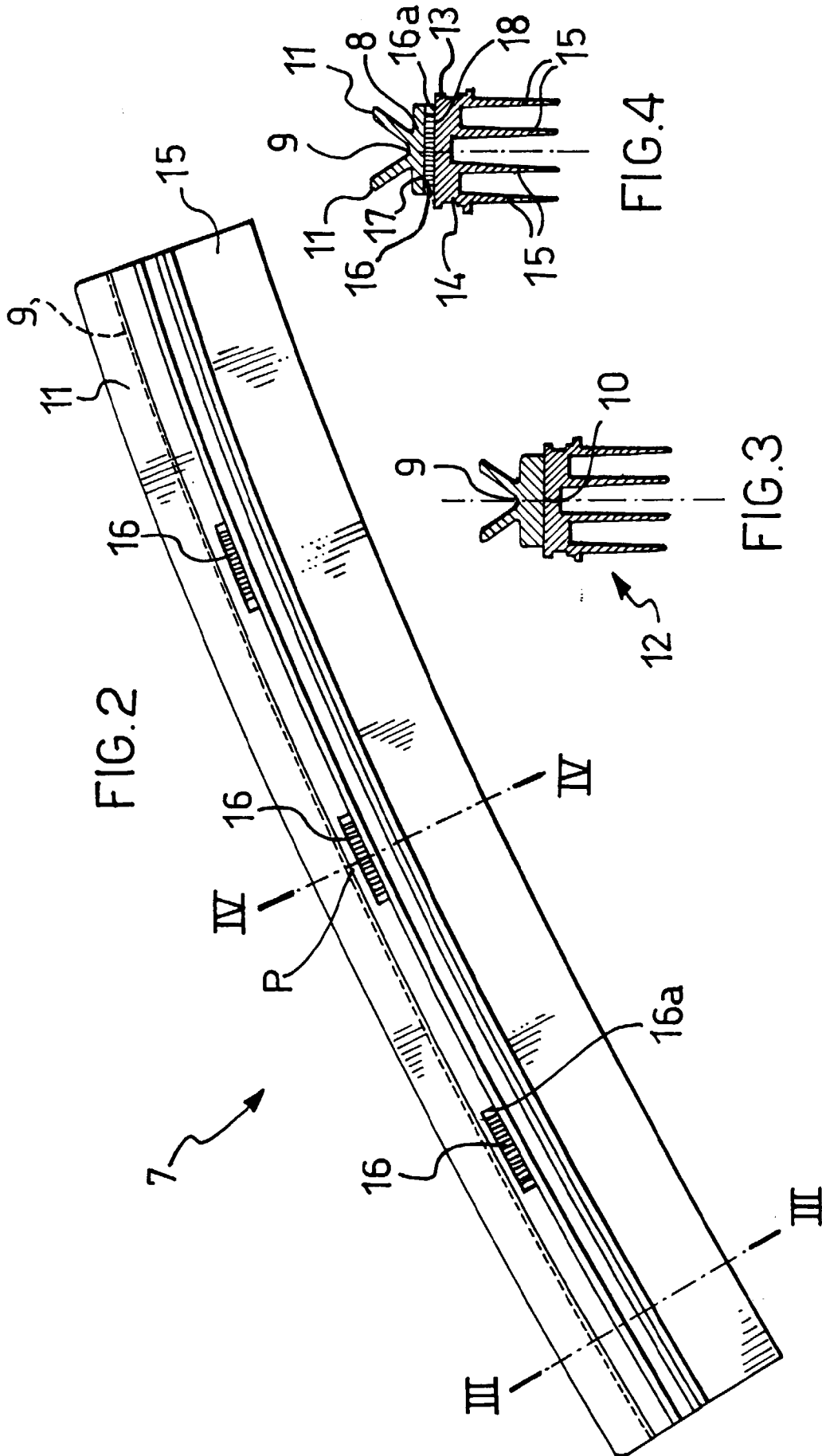
defined by the following claims.

Claims

1. Texturing machine (1) of the type comprising in a frame (2) a yarn path (3) for a yarn (F) to be textured, running between a feeder on the creel side (4) and a feeder on the collection side (5), together with a heater (6) and a cooler (7) disposed in succession along the said yarn path (3), characterized in that the cooler (7) comprises a guide (8) for the yarn (F) running along the said yarn path (3) and at least one Peltier element (16) associated with the said guide (8) and having a cold surface (17) facing the said yarn path (3). 5 10 15
2. Texturing machine (1) according to Claim 1, characterized in that it comprises means of regulation (19a) for regulating the electrical current supplied to the said at least one Peltier element (16). 20
3. Texturing machine (1) according to Claim 2, characterized in that the said means of regulation (19a) comprise a rheostat (19b). 25
4. Texturing machine (1) according to Claim 1, characterized in that it comprises a heat sink (12) associated with the guide (8) on a hot surface (18) of the said at least one Peltier element (16). 30
5. Texturing machine (1) according to Claim 4, characterized in that it comprises a current of air (32) formed in a duct (32) running along the heat sink (12). 35
6. Texturing machine (1) according to Claim 4, characterized in that the heat sink (12) faces upwards.
7. Texturing machine (1) according to Claim 1, characterized in that there is a plurality of Peltier elements distributed along the guide. 40
8. Texturing machine (1) according to Claim 7, characterized in that the said plurality of Peltier elements is distributed along the guide (8) in a non-uniform way, so that there is a localized clustering at a predetermined point (P) of the guide. 45
9. Texturing machine (1) according to Claim 8, characterized in that the said predetermined point (P) of the guide (8) is located at the centre of the guide. 50
10. Texturing machine (1) according to Claim 1, characterized in that the said at least one Peltier element has dimensions of 30 mm × 30 mm × 4 mm and is supplied at a voltage of between 1 and 6 volts. 55
11. Process of texturing a yarn (F), of the type compris-

ing a phase of cooling the yarn (F) along a yarn path (3) from the exit of a heater (6), characterized in that the cooling phase comprises the placing of a cold surface (17) of at least one Peltier element (16) facing the said yarn path (3).





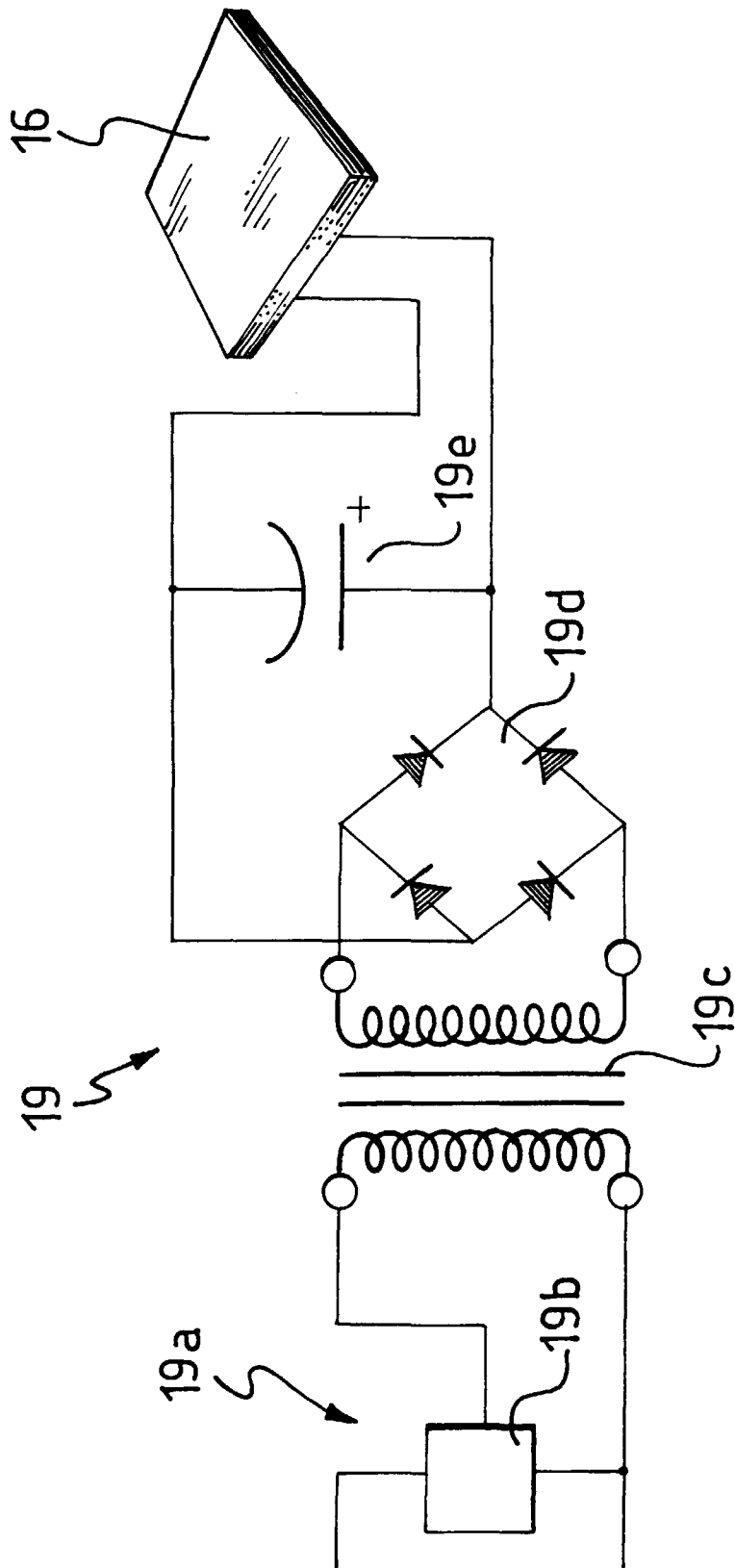
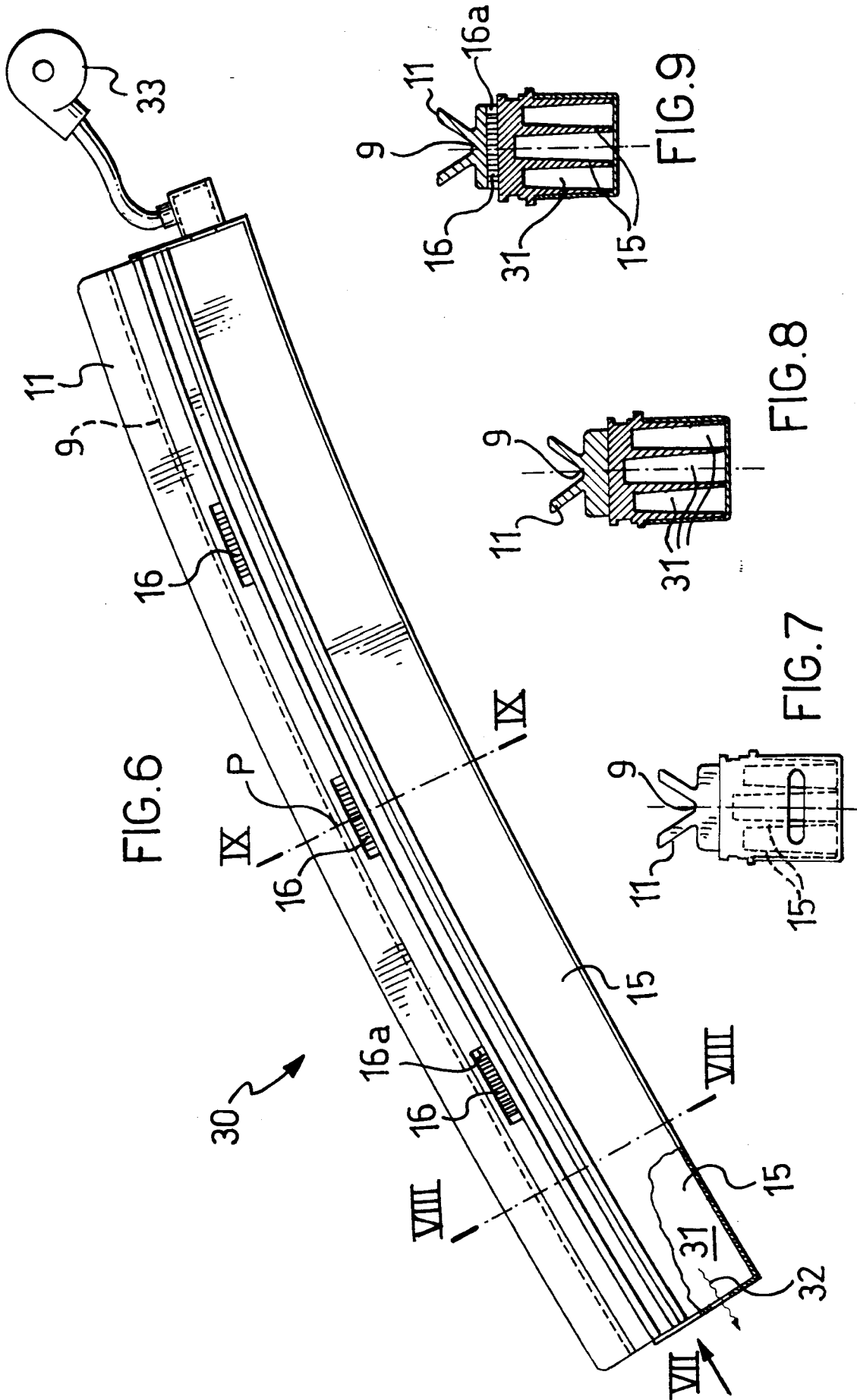
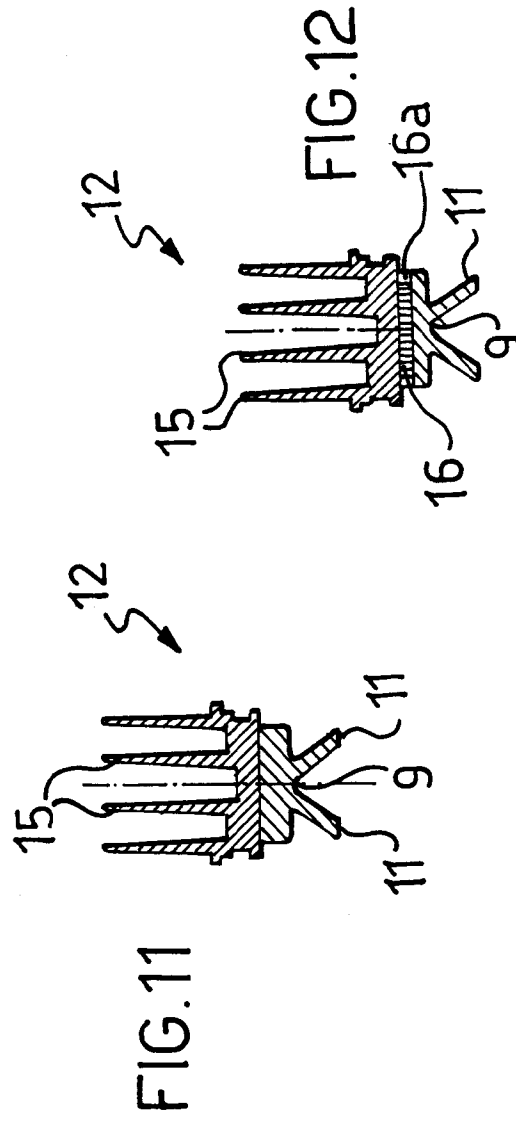
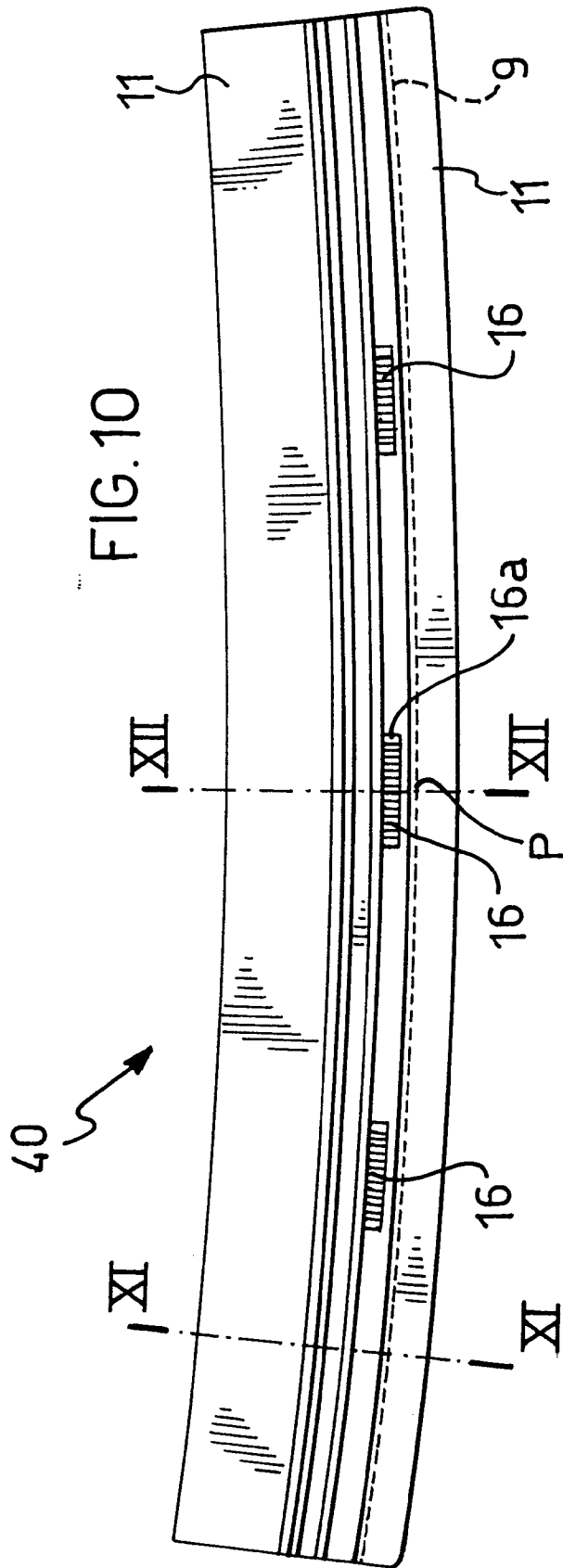


FIG.5







European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 83 0384

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.6)
Y	US 4 035 879 A (SCHIPPERS HEINZ) 19 July 1977 * column 12, line 64 - column 14, line 30; figure 6 *	1,11	D02J13/00 D02J1/22 D02G1/00 B65H57/00
Y	EP 0 807 701 A (RIVA OFF MEC) 19 November 1997 * the whole document *	1,11	
A	US 3 602 951 A (STANLEY ROBERT K) 7 September 1971 * column 1, line 69 - column 2, line 15; figure 1 *	1-11	
A	DATABASE WPI Section Ch, Week 8436 Derwent Publications Ltd., London, GB; Class A32, AN 84-222299 XP002085093 & JP 59 130338 A (MITSUBISHI RAYON CO LTD) , 26 July 1984 * abstract *	1,11	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			D02J D02G B65H B29D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 November 1998	Examiner Barathe, R
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P4/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 83 0384

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-11-1998

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4035879 A	19-07-1977	DE 2446139 A BR 7506204 A FR 2286213 A GB 1472047 A JP 51060731 A	15-04-1976 03-08-1976 23-04-1976 27-04-1977 26-05-1976
EP 0807701 A	19-11-1997	NONE	
US 3602951 A	07-09-1971	US 3505444 A US 3536807 A	07-04-1970 27-10-1970