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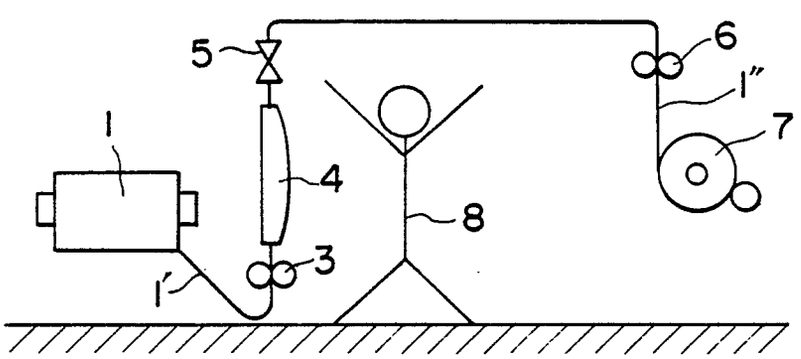
(54) False twist crimping machine.

(57) A false twisting machine and method are disclosed in which the filaments of a yarn can be sufficiently crimped with the use of a heater having a length of less than 1.0 m. To this end, feed rollers (3), a heater (4) and a false twisting means (5) are sequentially disposed in the advancing direction of a yarn (1') substantially on a staight line. The distance between the feed rollers and the upstream end of the heater is less than 300 mm, and the length of the heater is greater than 300 mm but less than 1,000 mm. According to the present invention, the length of the heater (4) can be greatly reduced by maintaining the heater at a relatively higher temperature while taking account of self heating of the yarn during drawing and/or false twisting of the nylon yarn.

FIG. 3



EP 0 281 657 A1

FALSE TWISTING MACHINE AND APPARATUS

Technical Field

This invention relates to a false twisting machine and method for false twisting filaments, fibers and yarns such as those made of nylon or like other synthetic materials, and more particularly, to such a machine and method in which a heater for heating filaments, fibers and yarns has a length extremely shorter than a conventional one.

Related Background Art

In false twisting, it is an essential requirement to heat filaments of a yarn in a false twisting zone in order to impart crimpiness to the filaments, and hence a false twisting machine is necessarily provided with a heater. In recent years, the feeding speed of a yarn becomes higher and higher so that the length of the heater has to be made greater so as to ensure a desired heating period of time. In fact, with a false twisting machine having a feeding speed of above 500 meters per minute, there is employed a heater having a length of above 1.5 m, or usually about 2.0 m in the case of a contact-type heater. Today, a lot of nylon fibers have been employed for making panty stockings, tights or the like, and in cases where these nylon fibers are false twisted, the nylon fibers are heated, similar to fibers of other synthetic materials, to a relatively low temperature by means of a heater having a length of 2 m or therearound.

In a false twisting machine, it is intrinsically desirous to arrange feed rollers, a heater, and a twisting means on a straight line, but because of the use of such a long heater, which is usually disposed vertically or obliquely so as to avoid an increase in width or lateral dimensions of the machine from the view point of workability, these members can not be arranged in a straight manner. The reason for this is that if they are arranged on a vertical or oblique straight line, the height of the machine will be too large, for example, more than 4 m high, and hence become uneconomical and low in workability. Accordingly, to avoid this, the feed rollers, the heaters and twisting means are compelled to be disposed on a curved or bent line. Specifically, as shown in Fig. 1, the parth of the yarn is bent at a location between a pair of feed rollers 3 and a heater 4, or at a location between a heater 4 and a twisting means 5, as shown in Fig. 2. Such an arrangement, however, has the disadvantage that the transmission of a twisting motion of the yarn is reduced at a location in which the yarn is bent. Futher, as the length of the heater increases, the height of the false twisting machine becomes greater, for example, 3 m or more, so that the building, in which the machine is installed, will be higher, thus increasing the construction cost for the building as well as the production cost of the machine itself. In addition, a worker has to set the yarn on the machine by using a long rod so that working efficiency will be reduced. Also, maintenance of the machine will be difficult and inefficient.

Disclosure of the Invention

In view of the above, the present invention is intended to obviate the above-described problems of the prior art.

An object of the present invention is to provide a novel and improved false twisting machine and method in which the filaments of a yarn can be sufficiently crimped with the use of a heater having a length of less than 1.0 m.

In order to achieve the above object, according to one aspect of the present invention, there is provided a false twisting machine including feed rollers, a heater and a false twisting means, the machine being characterized in that the feed rollers, the heater and the false twisting means are sequentially disposed in the advancing direction of a yarn substantially on a straight line, and that the distance between the feed rollers and the upstream end of the heater is less than 300 mm, and that the length of the heater is greater than 300 mm but less than 1,000 mm.

According to another aspect of the present invention, there is provided a false twisting machine including first feed rollers, second feed rollers disposed downstream of the first feed rollers, a heater and a false twisting means, the machine being characterized in that the second feed rollers, the heater and the false twisting means are sequentially disposed in the advancing direction of a yarn substantially on a straight line, and that the distance between the second feed rollers and the upstream end of the heater is

less than 300 mm, and that the length of the heater is greater than 300 mm but less than 1,000 mm.

According to a further aspect of the present invention, there is provided a false twisting method for false twisting an undrawn nylon yarn of less than 50 denier or a partially drawn nylon yarn of less than 50 denier at a feeding speed greater than 500 m/min, the method being characterized by the steps of:

disposing feed rollers, a heater and a false twisting means sequentially in the advancing direction of the yarn substantially on a straight line;

setting the distance between the feed rollers and the upstream end of the heater less than 300 mm; and

setting the length of the heater greater than 300 mm but less than 1,000 mm.

According to a still further aspect of the present invention, there is provided a false twisting method for false twisting an undrawn nylon yarn of less than 50 denier or a partially drawn nylon yarn of less than 50 denier at a feeding speed greater than 500 m/min, the method being characterized by the steps of:

drawing the yarn between first feed rollers and second feed rollers disposed downstream of the dirst feed rollers;

disposing the second feed rollers, a heater and a false twisting means sequentially in the advancing direction of the yarn substantially on a straight line;

setting the distance between the second feed rollers and the upstream end of the heater less than 300 mm; and

setting the length of the heater greater than 300 mm but less than 1,000 mm.

According to the present invention, the length of the heater can be greatly reduced, as compared with that of a conventional heater which has been considered necessary in the prior art false twisting technique, by maintaining the heater at a relatively higher temperature while taking account of self heating during drawing and/or false twisting of the nylon yarn. As a consequence, it becomes possible to arrange the feed rollers, the heater and the false twisting means on a straight line so that the height of the false twisting machine can be made less than 2.5 m, preferably within the reach of a worker.

A few examples of a false twisting machine constructed in accordance with the present invention are illustrated in comparison with conventional machines in the accompanying drawings, in which:

Fig. 1 is a schematic view showing a conventional false twisting machine;

Fig. 2 is a schematic view showing another conventional false twisting machine;

Fig. 3 is a schematic view showing a false twisting machine in accordance with the present invention;

Fig. 4 is a schematic view showing a conventional false twisting machine for undrawn and partially drawn yarns

Fig. 5 is a schematic view showing another conventional twisting machine for partially drawn and fully drawn yarns;

Fig. 6 is a graphic representation of Table 1, showing the results of Example 1;

Fig. 7 is a graphic representation of Table 2, showing the results of Example 2;

Fig. 8 is a graphic representation of Table 3, showing the results of Example 3;

Fig. 9 is a schematic view showing a false twisting machine employed for a Test Example;

Fig. 10 is a graphic representation of Table 4, showing the case of out-drawing in which the feeding speed is 800 meters per minute; and

Fig. 11 is a graphic representation of Table 4, showing the case of out-drawing in which the feeding speed is 800 meters per minute.

Description of Special Embodiments

Referring first to Fig. 4, there is shown a conventional false twisting machine of out-drawing type for undrawn yarns (referred to as U.D.Y.) and partially drawn yarns (referred to as P.D.Y), the machine being adapted to draw a yarn between a pair of first feed rollers 2 and a pair of second feed rollers 3. In this connection, however, the yarn can also be drawn between the second feed rollers 3 and a pair of delivery rollers 6. The false twisting machine illustrated in Fig. 4 includes a supply bobbin 1 for supplying an untreated nylon yarn 1′, the pair of first feed rollers 2, the pair of second feed rollers 3 disposed downstream of the first feed rollers 2, a heater 4 in the form of a contact-type heater for heating the untreated nylon yarn 1′ fed from the second feed rollers 3, a false twisting means 5 for imparting a twist to the yarn 1′ for crimping treatment thereof, the pair of delivery rollers 6 disposed downstream of the false twisting means 5, and a winding means 7 for winding up the crimped yarn 1″ delivered from the delivery rollers 6.

Fig. 5 shows another conventional false twisting machine of in-drawing type for partially drawn yarns (P.D.Y.) and fully drawn yarns (F.D.Y.). This machine has only one pair of feed rollers 3 and is adapted to

draw a yarn only between the feed rollers 3 and a pair of delivery rollers 6. The construction of this in-drawing type machine is similar to that of the out-drawing type machine as illustrated in Fig. 4 except for the first feed rollers 2 being omitted.

An untreated yarn in the form of an undrawn nylon yarn (U.D.Y.) was subjected to a false twisting treatment by means of the out-drawing type false twisting machine as illustrated in Fig. 4. Similarly, an untreated yarn in the form of a partially drawn nylon yarn (P.D.Y.) was subjected to a false twisting treatment by means of the in-drawing type false twisting machine as illustrated in Fig. 5. In both cases, the distance D between the feed rollers 3 and the upstream end of a heating portion of the heater 4 was set 150 mm, and the length L of the heater 4 was varied so as to change the temperature of the heater. Also, for comparison, a fully drawn nylon yarn (F.D.Y.) was likewise subjected to a false twisting treatment by means of the in-drawing type machine as illustrated in Fig. 5. The yarns treated in this manner were respectively knitted into fabrics by the use of a lab circular knitting machine which had a cylinder diameter of 3.5 inches and 240 needles. The elasticities of the respective fabrics thus obtained were measured in the following manner.

$$\text{elasticity } K = \frac{L_2 - L_1}{L_1} \times 100 \quad (\%)$$

where L_1 is the length of a fabric in a minute after a measuring load is applied to the fabric of a measuring length.

The following Examples 1 and 2 relate to a nylon yarn of 15 denier (De) including 5 filaments and a nylon yarn of 35 De including 10 filaments, respectively. The test results thereof are shown in Tables 1 and 2 and in Figs. 6 and 7. For comparison, a partially drawn nylon yarn (P.D.Y.) of 70 De including 24 filaments and a fully drawn yarn (F.D.Y.) of the same size were false twisted by the in-drawing type false twisting machine as illustrated in Fig. 5, and the elasticities thereof were measured. The results obtained are shown in Table 3 and in Fig. 8.

Example 1 untreated yarns used: A ... nylon 6 U.D.Y. 15 de/5 F
B ... nylon 6 P.D.Y. 15 De/5 F
C ... nylon 6 F.D.Y. 15 De/5 F
machines used: A ... out-drawing type of Fig. 4
B, C ... in-drawing type of Fig. 5
distance D between the feed rollers 3 and the heating portion upstream end of the heater 4: 150 mm
feeding speed: 900 m/min

heater length L (m/m)	0	100	300	500	800	1000	1500	2000
heater temp. (°C)	-	230	210	200	190	160	160	158

rate of drawing	A	B	C
between rollers 2 and 3	2.9	-	-
between rollers 3 and 6	1.2	1.35	1.06
total rate of drawing:	3.5	1.35	1.06

Table 1

untreated yarn used / heater length	A (U.D.Y.) 15 De/5 F elasticity	B (P.D.Y.) 15 De/5 F elasticity	C (F.D.Y.) 15 De/5 F elasticity
0 (m/m)	159 (%)	146 (%)	51 (%)
100	250	248	111
300	441	425	321
500	442	442	380
800	441	440	429
1,000	422	418	421
1,500	381	380	378
2,000	382	377	380

Example 2 yarn used: nylon 6 P.D.Y. 35 De/10 F
machine used: in-drawing type of Fig. 5
distance D between the feed rollers 3 and the heating portion upstream end of the heater 4: 150 mm
feeding speed: 700 m/min

heater length L ((m/m)	0	100	300	500	800	1000	1500	2000
heater temp. (°C)	-	230	230	210	190	160	160	160

rate of drawing: 1.3
initial load: 24 g
measuring load: 2 Kg

Table 2

untreated yarn used / heater length	P.D.Y. 35 De/10 F
	elasticity
0 (mm)	110.2 (%)
100	195.0
300	232.1
500	257.6
800	256.3
1,000	254.5
1,500	241.2
2,000	239.7

Comparison Example yarn used: A nylon 6 P.D.Y. 70 De/24 F
B nylon 6 F.D.Y. 70 DE/24 F
machine used: A, B ... in-drawing type of Fig. 5
distance D between the feed rollers 3 and the heating portion upstream end of the heater 4: 150 mm
feeding speed 700 m/min

heater length L (m/m) :	0	100	300	500	800	1000	1500	2000
	-	230	230	230	210	200	175	165

rate of drawing: A ... 1.2
B ... 1.01
initial load: 24 g
measuring load: 2 Kg

Table 3

untreated yarns used / heater length	A (P.D.Y.) 70 De/24 F elasticity	B (F.D.Y.) 70 DE/ 24 F elasticity
0 (mm)	81.8 (%)	37.4 (%)
100	98.2	42.1
300	115.1	61.7
500	132.7	82.5
800	158.3	123.1
1,000	192.9	149.2
1,500	190.4	158.3
2,000	182.2	161.1

As seen from Figs. 6 and 7, the undrawn nylon yarns and the partially drawn nylon yarns of 15 De and 35 De have high and stable elasticities of knitted fabrics if the length of the heater is greater than 300 mm, and it is found that false twisted yarns of sufficiently good quality can be obtained even if the heater length is less than 1,000 mm, and particularly less than 800 mm, but greater than 300 mm. On the other hand, however, in case of the fully drawn nylon yarn, the elasticity of knitted fabric thereof is insufficient with the heater length ranging from 300 mm to 800 mm. Also, from Table 3 and Fig. 8 showing the test results of the Comparison Example, it can be seen that with the nylon yarn of 70 De, the elasticity thereof is low if the heater length is less than 800 mm. In this manner, in the false twisting treatments of the undrawn nylon yarn and the partially drawn nylon yarn, sufficiently high elasticities can be obtained by the use of a short heater. The reason for this is considered as follows: at the time when the yarn is being drawn or when the yarn is fed to the false twisting zone and being twisted there, it is self. heated under the action of rearrangement of nylon filament molecules and/or friction between filaments of the yarn , and then heated by means of the heater before it has been cooled enough so that the yarn can be heated to a required temperature even with a relatively small quantity of heat given from the heater. To confirm this, temperature variations on the surface of the nylon yarn were measured at locations I, II and III between the first feed rollers 2 and the heater 4, as illustrated in Fig. 9. The test conditions for such measurements are shown in the following Test Example, and the results obtained are shown in Table 4, of which the temperatures, measured at the respective measuring points at the feeding speed of 800 m/min, are illustrated in Figs. 9 and 10.

TEST EXAMPLE

Using the untreated yarns and the false twisting machines as specified below, the temperatures of the yarns were measured at locations I, II, III as illustrated in Fig. 9 by means of a temperature detector. The same tests were carried out by varying the feeding speeds of the yarns.

yarns used:	U.D.Y. 30 De/10 F	P.D.Y. 30 De/8 F		F.D.Y. 15De/5F x 2
machines used:	A out-draw of Fig.4	B out-draw of Fig.4	C in-draw of Fig.5	D in-draw of Fig.5
rate of drawing between				
rollers 2 & 3:	3.45	1.30	-	-
rollers 3 & 6:	1.00	1.00	1.30	0.93

heater length: 500 mm
heater temp. : 180 °C
room temp. : 22 °C

Table 4

feeding speeds (m/min)	500	600	700	800	900	1000
	yarn temperaturs (°C)					
A (U.D.Y., out-drawn)						
I	63.1	65.3	65.8	64.5	63.6	63.7
II (Twist)	36.8	40.4	42.2	44.9	46.4	48.4
(Free)	30.0	31.9	31.8	34.3	34.3	35.8
III (Twist)	31.0	33.1	33.7	34.0	34.5	37.1
(Free)	25.9	28.6	29.5	30.9	31.8	33.4
B (P.D.Y., out-drawn)						
I	35.0	35.5	36.1	36.6	37.1	37.1
II (Twist)	38.0	40.5	40.7	42.1	43.4	43.2
(Free)	30.0	30.6	31.2	32.5	33.1	33.2
III (Twist)	31.9	33.1	33.5	32.0	32.6	33.7
(Free)	27.3	28.9	28.4	29.0	28.5	29.0
C (P.D.Y., in-drawn)						
II (Twist)	32.0	35.4	35.9	37.1	36.7	38.0
(Free)	27.2	27.8	27.8	28.3	27.7	27.8
III (Twist)	28.6	29.3	30.0	30.8	31.8	31.2
(Free)	23.7	23.6	24.0	24.1	24.5	24.2
D (F.D.Y., in-drawn)						
II (Twist)	31.4	34.6	34.1	35.0	35.8	37.0
(Free)	26.9	26.7	27.3	27.4	27.9	28.5
III (Twist)	26.9	27.1	27.7	27.9	27.2	26.1
(Free)	23.7	22.8	23.1	22.3	21.2	22.2

As shown in Fig. 4, the temperatures of the undrawn nylon yarn and the partially drawn nylon yarn, being drawn between the first feed rollers 2 and the second feed rollers 3 in the out-drawing type machine illustrated in Fig. 4, are higher than room temperature, and therefore it is recognized that these yarns are self heating. This is supported by the fact that at the location I, the undrawn yarn of a higher drawing rate is higher in temperature than the partially drawn yarn of a lower drawing rate. As the temperature of the feed rollers 3 is substantially equal to room temperature, it is inferred that the nylon yarns are cooled during passage thereof through the feed rollers 3. When the temperature of a nylon yarns (Free) not twisted after its passage through the feed rollers 3 is compared with that of a nylon yarn (Twist) twisted after its passage

through the feed rollers 3, the latter is higher than the former in any of the undrawn yarns, the partially drawn yarns and the fully drawn yarns. In particular, in case of the partially drawn nylon yarn B (P.D.Y., out-drawn), it is seen that the temperature of the yarn is raised to a much higher value after its passage through the delivery rollers 3 than before. From these facts, it is inferred that a nylon yarn generates heat due to friction between filaments of the yarn caused by twisting thereof. Also, from the fact that the temperature of the yarn is low at the location III than at the location II, it is understood that the generation of heat takes place immediately after passage of the yarn through the delivery rollers 3, and thereafter the yarn thus heated is cooled as it proceeds to the winding means. Further, at the location II, the partially out-drawn yarn B is lower in temperature than the partially in-drawn yarn C, which is considered due to the fact that with the in-drawing type false twisting machine, the yarn will presumably be drawn within the heater of high temperature disposed downstream of the location II, and hence the partially in-drawn yarn C is free from the influence of self-heating due to drawing thereof.

According to the above results, it will be understood that it is most effective to heat a nylon yarn, self-heated to a high temperature due to drawing and/or twisting thereof, by means of a heater before it has been sufficiently cooled.

As described in the foregoing, according to the present invention, in the false twisting process of an undrawn nylon yarn or a partially drawn nylon yarn, the length of a heater can be reduced below 1,000 mm, and particularly below 800 mm if it is greater than 300 mm even when the feeding speed of the yarn is over 500 m/min. This provides a remarkable advantage from the viewpoint of minimization in size of a false twisting system. In particular, in false twisting of a nylon yarn of small denier, the transmission of a twisting movement is reduced if the yarn is bent at a location between the heater and the false twisting means. To avoid this, it is desired to arrange the heater and the false twisting means on a straight line, and hence conventional false twisting machines generally have relatively large heights. In the present invention, however, it becomes possible to produce a new false twisting machine which has a relatively low height, i.e, within the reach of a worker standing on the floor, and in which the heater and the false twisting means can be disposed on a straight manner.

Claims

1. A false twisting machine including feed rollers, a heater and a false twisting means, characterized in that said feed rollers, said heater and said false twisting means are sequentially disposed in the advancing direction of a yarn substantially on a straight line, and that the distance between said feed rollers and the upstream end of said heater is less than 300 mm, and that the length of said heater is greater than 300 mm but less than 1,000 mm.

2. A false twisting machine as set forth in claim 1, characterized in that the feeding speed of said yarn is over 500 m/min.

3. A false twisting machine as set forth in claim 1, characterized in that an undrawn nylon yarn of less than 50 denier or a partially drawn nylon yarn of less than 50 denier is subjected to a false twisting treatment.

4. A false twisting machine as set forth in claim 1, characterized in that the length of said heater is greater than 300 mm but less than 800 mm.

5. A false twisting machine as set forth in claim 1, characterized in that the distance between said feed rollers and the upstream end of said heater is less than 200 mm.

6. A false twisting machine including first feed rollers, second feed rollers disposed downstream of said first feed rollers, a heater and a false twisting means, characterized in that said second feed rollers, said heater and said false twisting means are sequentially disposed in the advancing direction of a yarn substantially on a straight line, and that the distance between said second feed rollers and the upstream end of said heater is less than 300 mm, and that the length of said heater is greater than 300 mm but less than 1,000 mm.

7. A false twisting machine as set forth in claim 6, characterized in that the feeding speed of said yarn is over 500 m/min.

8. A false twisting machine as set forth in claim 6, characterized in that an undrawn nylon yarn of less than 50 denier or a partially drawn nylon yarn of less than 50 denier is subjected to a false twisting treatment.

9. A false twisting machine as set forth in claim 6, characterized in that the length of said heater is greater than 300 mm but less than 800 mm.

10. A false twisting machine as set forth in claim 6, characterized in that the distance between said second feed rollers and the upstream end of said heater is less than 200 mm.

11. A false twisting method for false twisting an undrawn nylon yarn of less than 50 denier or a partially drawn nylon yarn of less than 50 denier at a feeding speed greater than 500 m/min, characterized by the steps of:

disposing feed rollers, a heater and a false twisting means sequentially in the advancing direction of said yarn substantially on a straight line;

setting the distance between said feed rollers and the upstream end of said heater less than 300 mm; and

setting the length of said heater greater than 300 mm but less than 1,000 mm.

12. A false twisting method for false twisting an undrawn nylon yarn of less than 50 denier or a partially drawn nylon yarn of less than 50 denier at a feeding speed greater than 500 m/min, characterized by the steps of:

drawing said yarn between first feed rollers and second feed rollers disposed downstream of said dirst feed rollers;

disposing said second feed rollers, a heater and a false twisting means sequentially in the advancing direction of said yarn substantially on a straight line;

setting the distance between said second feed rollers and the upstream end of said heater less than 300 mm; and

setting the length of said heater greater than 300 mm but less than 1,000 mm.

FIG. 1

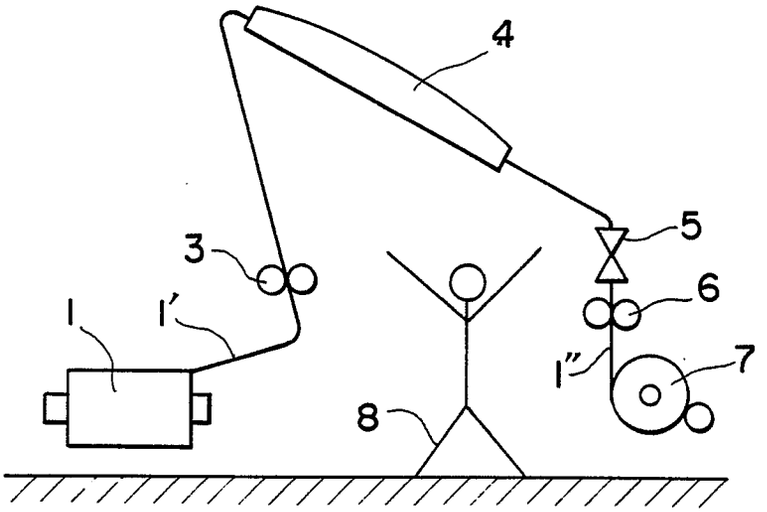


FIG. 2

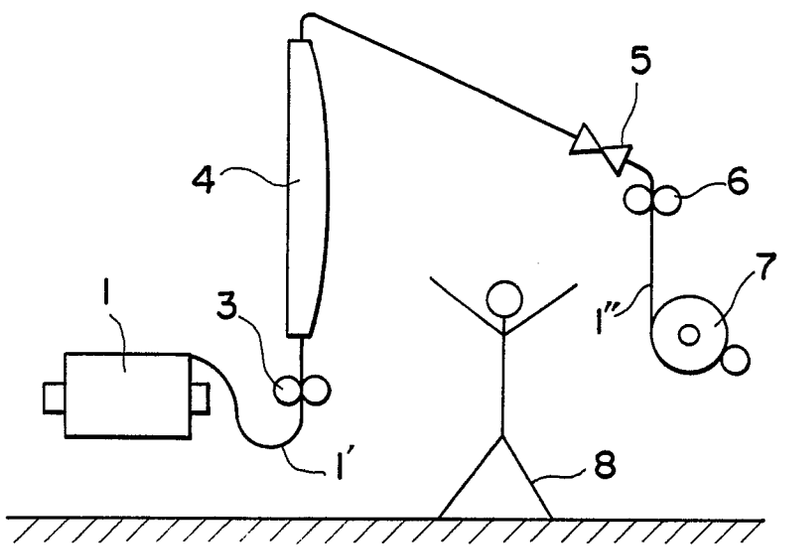


FIG. 3

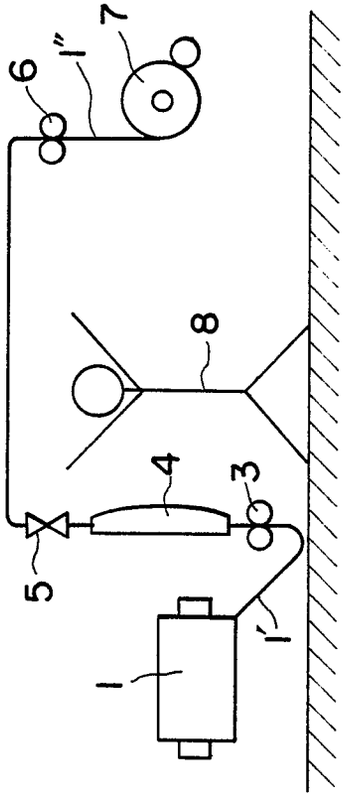


FIG. 9

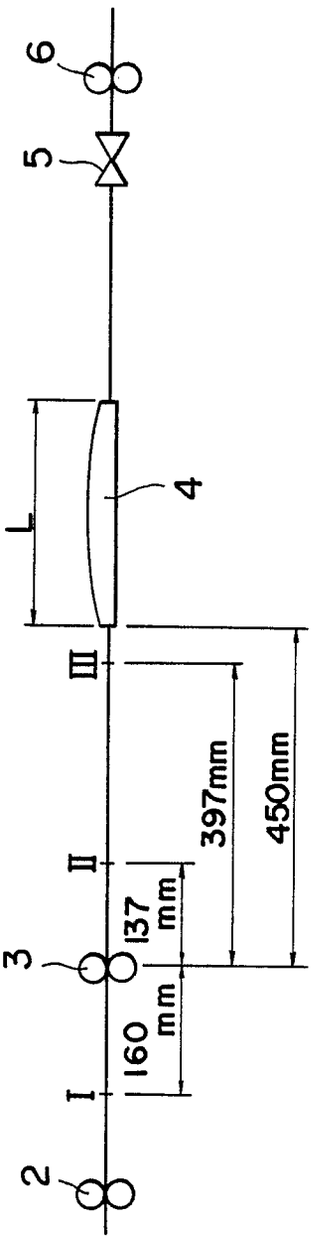


FIG. 5

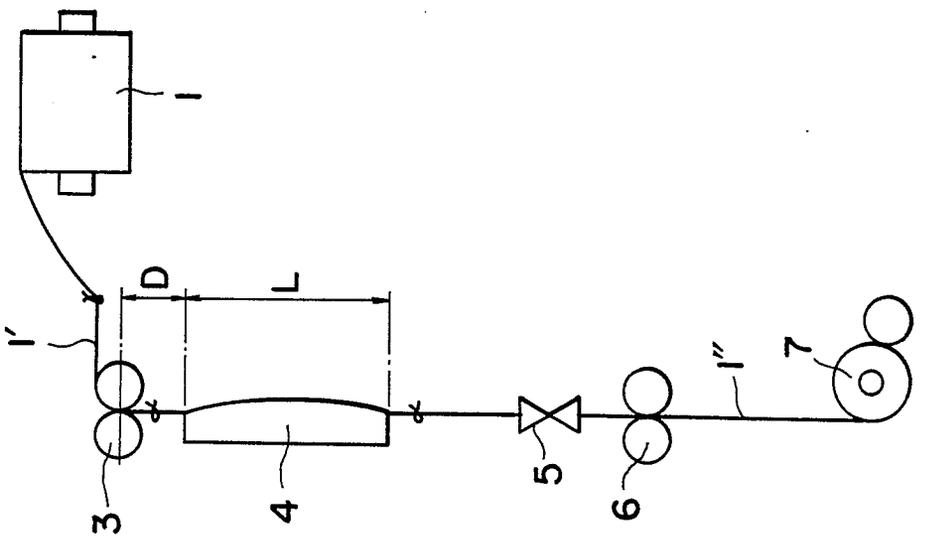


FIG. 4

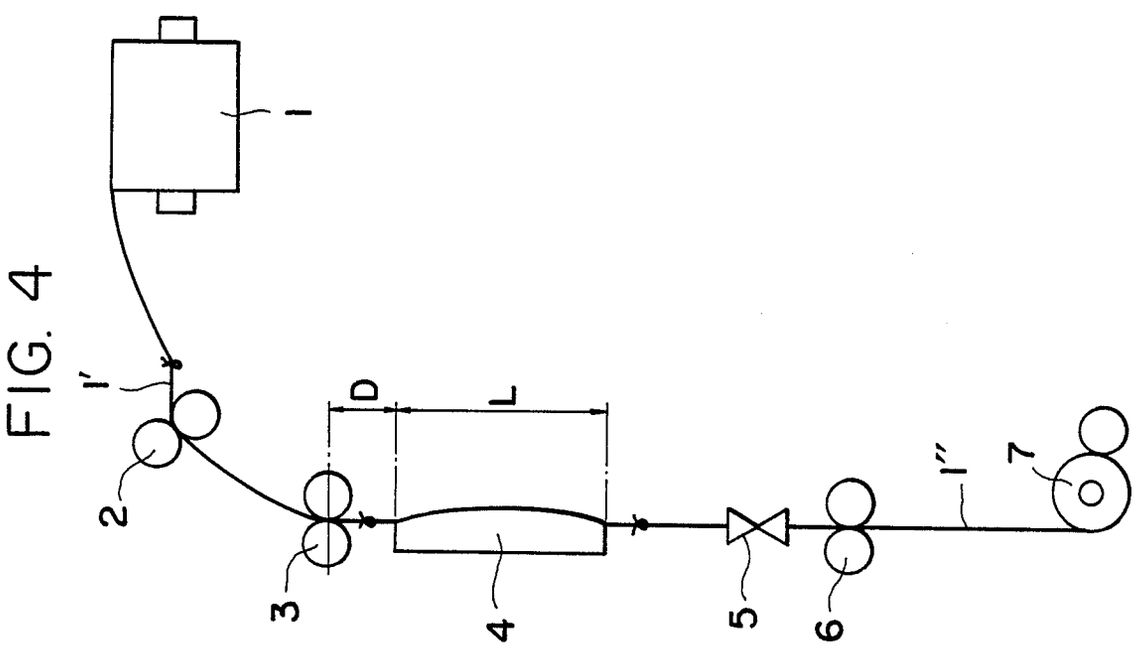


FIG. 6

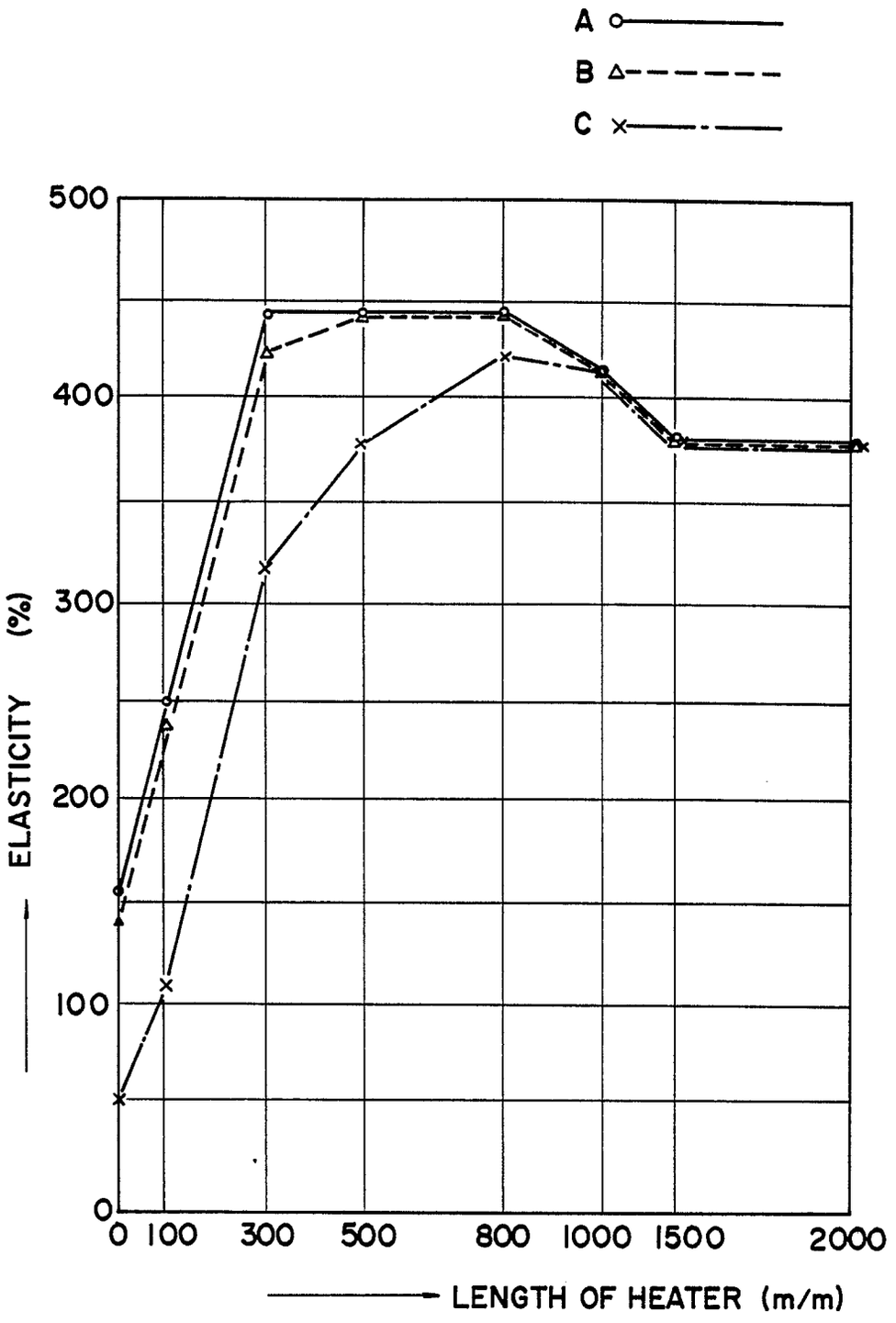
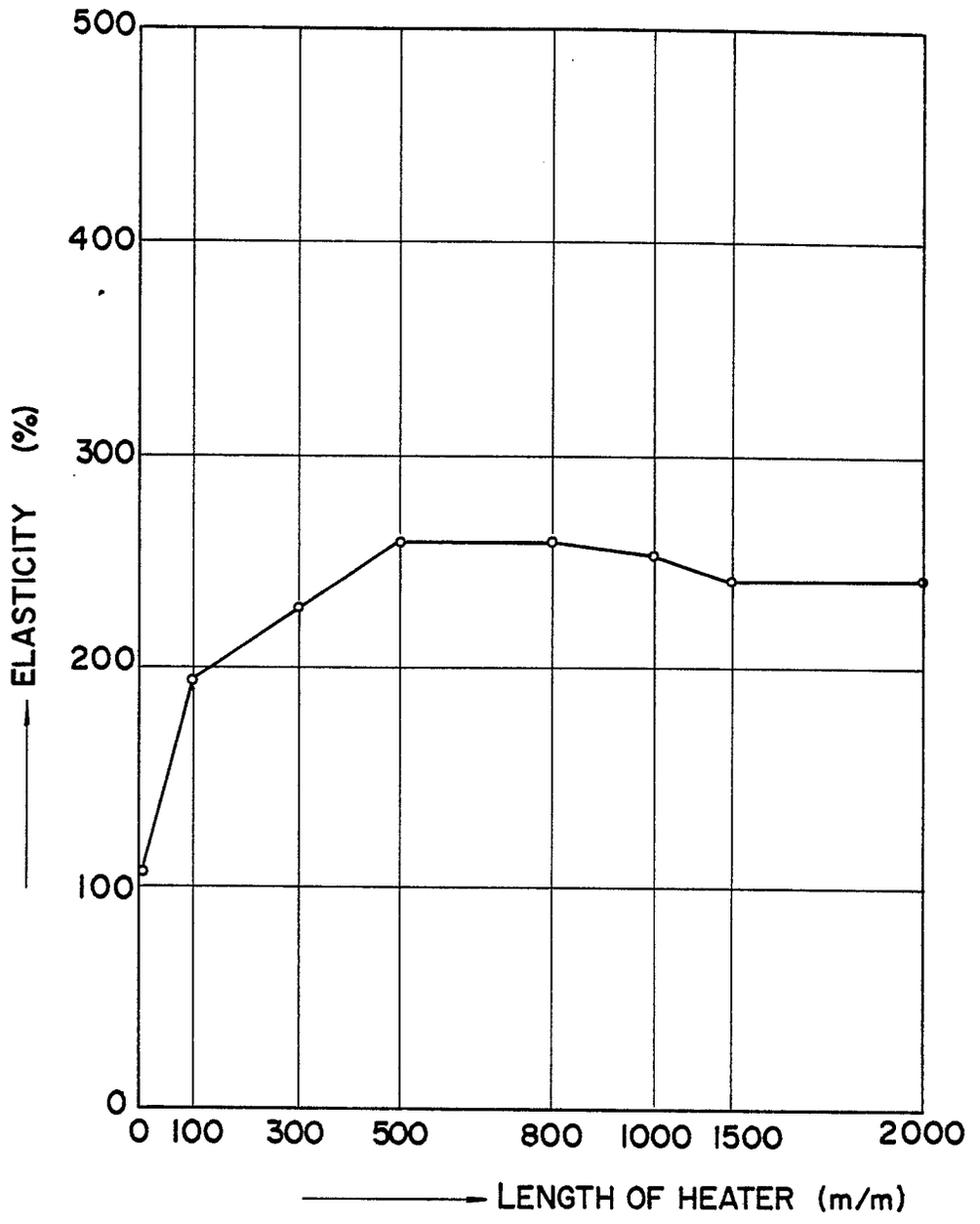

A
B
C
500
400
300
200
100
0
ELASTICITY (%)
0
100
300
500
800
1000
1500
2000
LENGTH OF HEATER (m/m)

FIG. 7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400
300
200
100
0
ELASTICITY (%)
0 100 300 500 800 1000 1500 2000
LENGTH OF HEATER (m/m)

FIG. 8

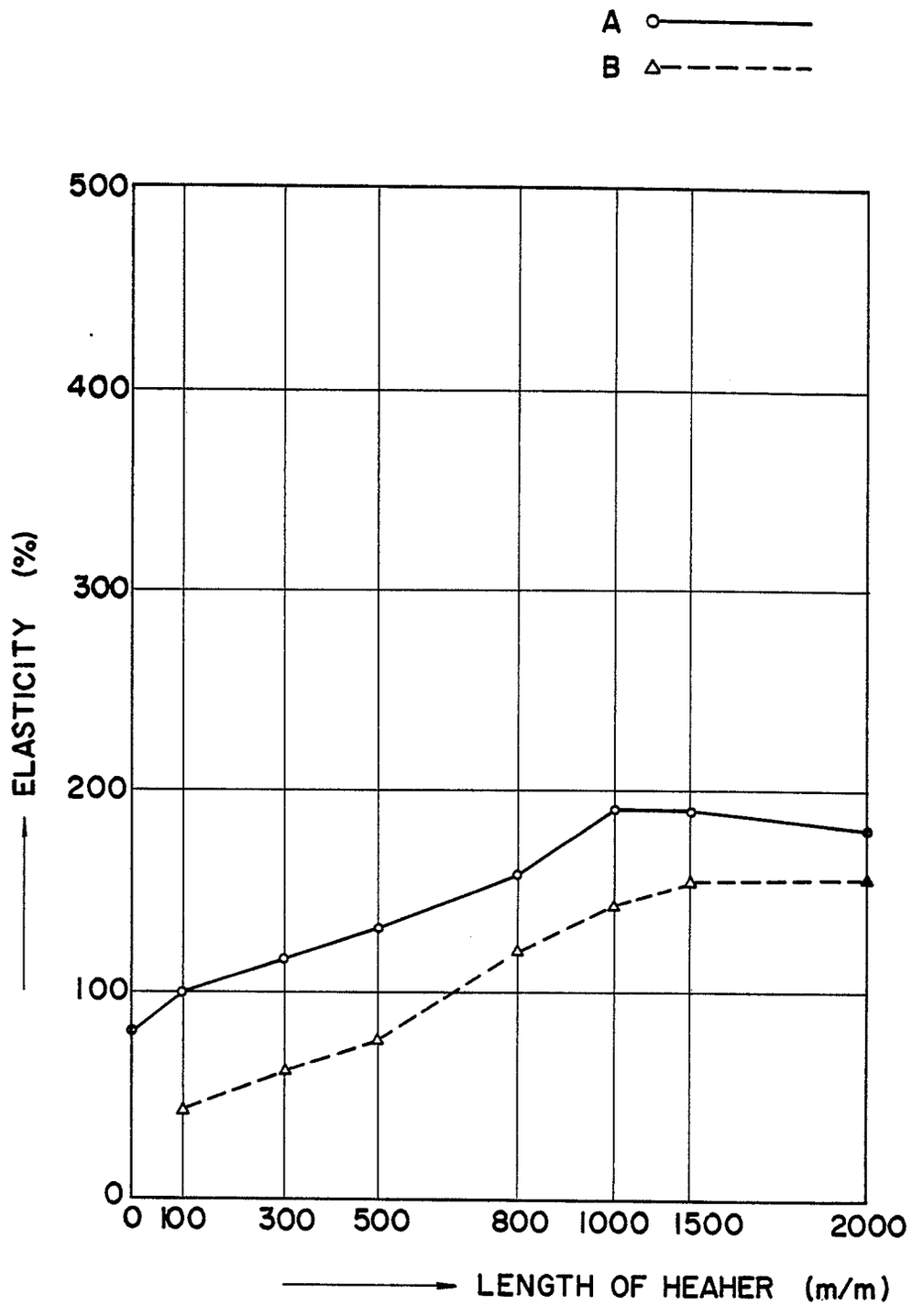

A
B
500
400
300
200
100
0
ELASTICITY (%)
0 100 300 500 800 1000 1500 2000
LENGTH OF HEAHER (m/m)

FIG. 10

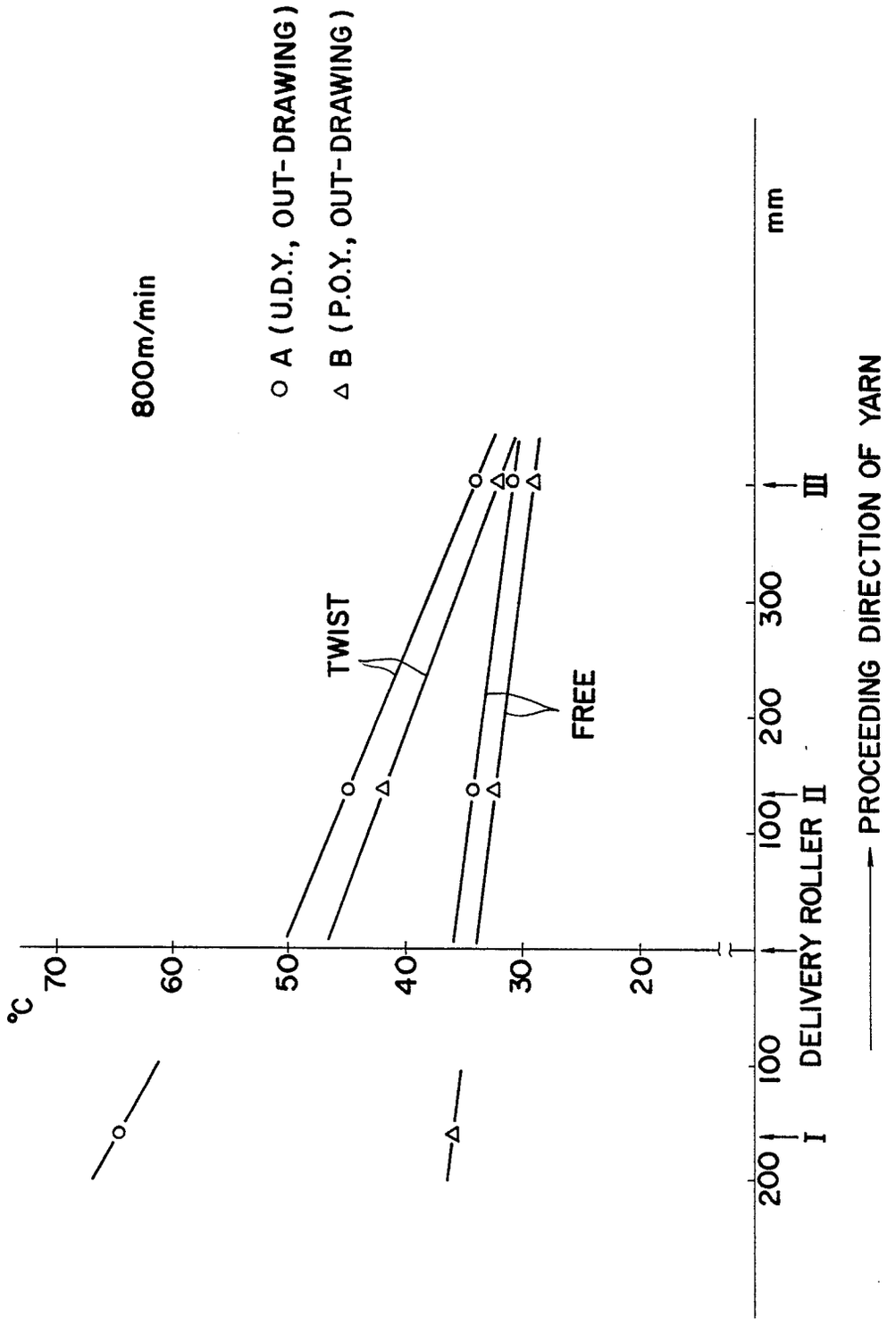
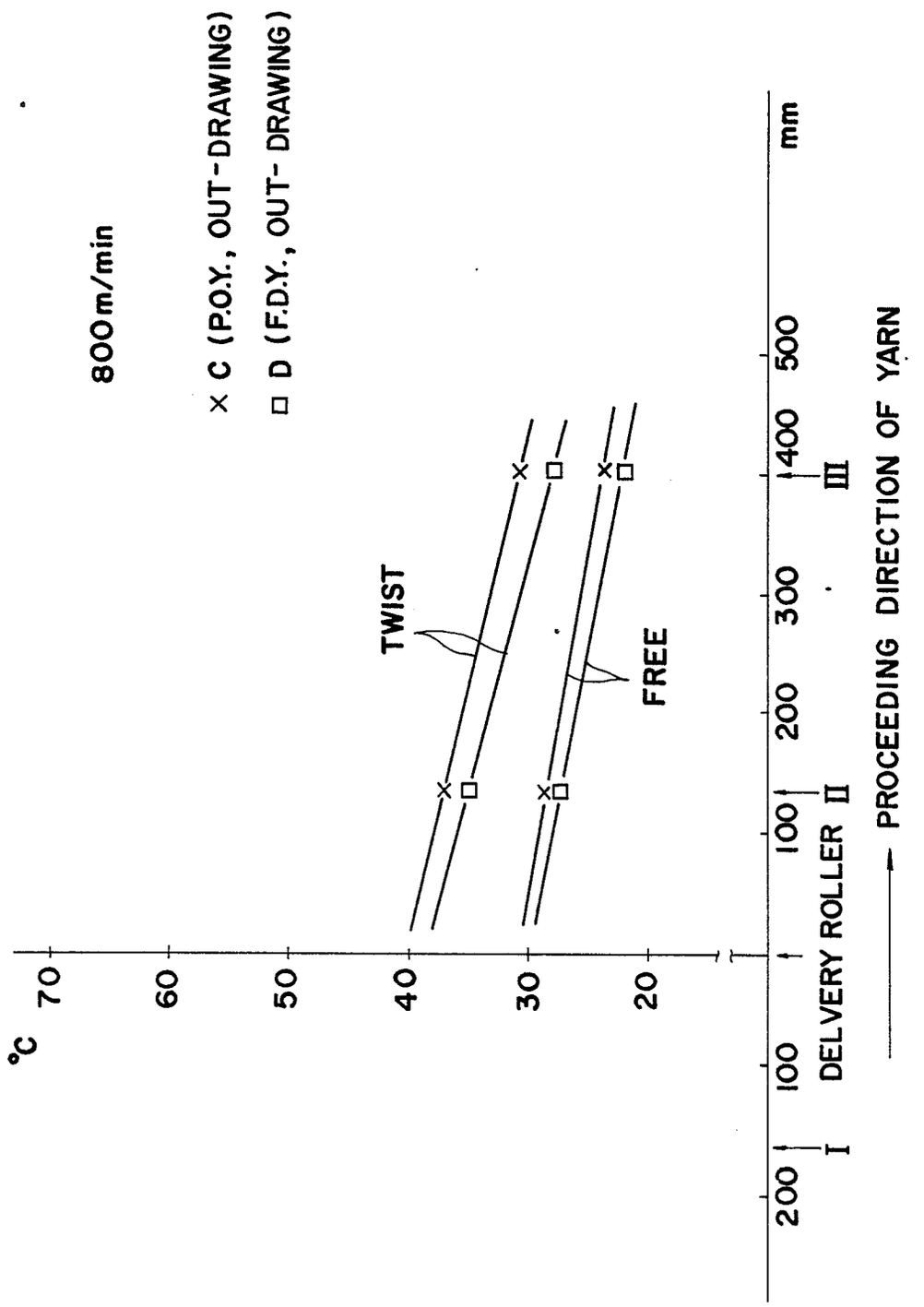

800m/min
○ A (U.D.Y., OUT-DRAWING)
△ B (P.O.Y., OUT-DRAWING)
TWIST
FREE
℃
70
60
50
40
30
20
200
100
100
200
300
mm
I
DELIVERY ROLLER II
III
PROCEEDING DIRECTION OF YARN

FIG. 11


800m/min
× C (P.O.Y., OUT-DRAWING)
□ D (F.D.Y., OUT- DRAWING)
°C
70
60
50
40
30
20
TWIST
FREE
200
100
I
DELVERY ROLLER II
100
200
300
400
III
500
mm
PROCEEDING DIRECTION OF YARN

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 87 10 3605

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.4)
A	US-A-3 367 096 (ALAMANCE) * Claim 1; column 4, lines 34-47; figure 1 * ---	1	D 02 G 1/02
A	US-A-3 449 898 (NIPPON RAYON) * Claim 1; column 1, line 29 - column 2, line 29 * ---	1	
A	US-A-3 956 878 (FIBER INDUSTRIES) * Column 1, lines 5-15; claim 1 * ---	1	
A	US-A-4 173 860 (McKLVEEN) * Claim 1; column 1, lines 50-64; column 2, lines 55-60 * ---	1	
A	US-A-3 955 351 (ICI) * Claim 1; example 1; figure * ---	1	
A	CHEMIEFASERN TEXTILINDUSTRIE, vol. 37/89, no. 2, February 1987, pages 102,103,106, Frankfurt a.M., DE; J. BRUSKE et al.: "Bedeutung der Texturierzonenlänge für den Falschdrahttexturierprozess" * Page 106, under: abstract * ---	1	TECHNICAL FIELDS SEARCHED (Int. Cl.4) D 02 G
A	CHEMIEFASERN TEXTILINDUSTRIE, vol. 31, no. 4, April 1981, pages 286-289, Frankfurt a.M., DE; M. BROSSMER: "Stand und Tendenzen bei der Entwicklung von Texturierheizern" * Page 288, under: "Entwicklungstendenzen" * -----	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25-11-1987	CATTOIRE V.A.

CATEGORY OF CITED DOCUMENTS

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