

12 **EUROPEAN PATENT APPLICATION**

21 Application number: 83730091.2

51 Int. Cl.³: **D 02 G 1/12**

22 Date of filing: 27.09.83

30 Priority: 27.09.82 JP 168044/82

43 Date of publication of application:
16.05.84 Bulletin 84/20

84 Designated Contracting States:
DE GB IT

71 Applicant: **POLYMER PROCESSING RESEARCH
INSTITUTE LIMITED**
9-2 Kaga 1-chome Itabashi-ku
Tokyo(JP)

71 Applicant: **The Bouligny Company**
433, W. Morehead Street
Charlotte, N.C. 28237(US)

72 Inventor: **Okada, Tokio**
38-15, Saginomiya 4-chome
Nakano-ku Tokyo(JP)

72 Inventor: **Kojima, Shigezo**
23-14, Kohinata 2-chome
Bunkyo-ku Tokyo(JP)

72 Inventor: **Tani, Haruhisa**
3-10-18-402, Takashimadaira
Itabashi-ku Tokyo(JP)

74 Representative: **Jander, Dieter, Dipl.-Ing. et al,**
Dipl.-Ing. Dieter Jander Dr.-Ing. Manfred Böning
Patentanwälte Kurfürstendamm 66
D-1000 Berlin 15(DE)

54 **Apparatus for crimping textile fibrous materials.**

57 An apparatus for crimping textile fibrous materials includes a stuffing box having an end portion surrounding opposite inner peripheral portions of rolls so as to define therebetween a substantially annular clearance communicating at an inner end with a stuffing chamber in the stuffing box. The stuffing box further has at least one channel for the passage therethrough of a pressurized fluid. The channel has an outlet opening to the end portion and communicating with the annular clearance. The outlet is spaced from the inner edge of the clearance by a distance substantially equal to or smaller than one-third of the width of the annular clearance. A stream of pressurized fluid injected from the opening into the clearance prevents the textile fibrous materials from being squeezed into the clearance even when the fibrous materials are fed by the rolls into the stuffing box at a higher speed.

- 1 -

BACKGROUND OF THE INVENTIONField of the Invention:

The present invention relates to an apparatus for crimping textile fibrous materials such as filaments, yarns, tows for staple fibers and the like.

Prior Art:

In the apparatus conventionally used to crimp textile strands to increase their bulkiness, a tow of paralleled continuous filaments is nipped between rotating crimper rolls and is forced into a stuffing-box crimper disposed adjacent to the crimper rolls. In the known apparatus, the tow of filaments to be crimped needs to be uniform in thickness and width over its entire length; otherwise it will be partly squeezed into a clearance between the rolls and crimper as it is fed by the rolls. With the filaments thus squeezed in the clearance, the apparatus is likely to become jammed and malfunctioned. Even such a uniform tow of filaments would not avoid wedging into the clearance when the rolls were rotated to feed the filaments at a speed above 200 m/min.

Japanese Patent Laid-Open Publication (Kokai) Nos. 53-90453 and 54-131065 published on August 9, 1978 and October 11, 1979, respectively, and assigned to the present assignee disclose somewhat successful apparatus. The apparatus include a stuffing box having a pair of spaced doctor blades facing at one end to the peripheral surfaces of crimping rolls, and a pair of chambers disposed on the

- 2 -

respective doctor blades for supplying a pressurized fluid into clearances between the peripheral surfaces and the one ends of the doctor blades to thereby preventing filaments from being squeezed into the clearances. The known apparatus thus arranged however are complexed in structure and costly in manufacture. The doctor blades are likely to become distorted under severe forces applied thereto by the pressurized fluid in the chambers with the result that uniform clearances between the rolls' peripheral surfaces and the ends of the respective doctor blades cannot be maintained.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a crimping apparatus which can produce crimped textile fibrous materials at an increased rate of production without incurring the fibrous materials squeezed into clearances in the apparatus.

Another object of the present invention is to provide an apparatus for crimping textile fibrous materials which is relatively simple in structure and hence is inexpensive to manufacture.

According to the present invention, a crimping apparatus includes a stuffing box having an end portion surrounding opposite inner peripheral portions of rolls so as to define therebetween a substantially annular clearance communicating at an inner end thereof a stuffing chamber in the stuffing box. The stuffing box further has means

- 3 -

defining a channel for the passage therethrough of a pressurized fluid. The channel has an outlet opening to the end portion and communicating with the annular clearance. The outlet is spaced from the inner edge of the clearance by a distance substantially equal to or smaller than one-third of the width of the annular clearance. A stream of pressurized fluid injected from the opening into the clearance prevents textile fibrous materials from being squeezed into the clearance as the fibrous materials are fed by the rolls into the stuffing box.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheets of drawings in which preferred structural embodiments incorporating the principles of the present invention are shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic longitudinal cross-sectional view of a crimping apparatus according to the present invention;

FIG. 2 is a fragmentary rear end view of FIG. 1;

FIG. 3 is a front elevational view of a portion of the apparatus shown in FIG. 1;

FIG. 4a is a plan view of FIG. 3;

FIG. 4b is a view similar to FIG. 4a, showing a modified doctor blade;

-4-

FIG. 5 is a schematic plan view showing a modified apparatus with parts removed for clarity;

FIG. 6 is a front elevational view of FIG. 5;

FIG. 7 is a view similar to FIG. 5, showing another modification;

FIG. 8 is an enlarged plan view showing a portion of the modified apparatus shown in FIG. 7; and

FIG. 9 is a view similar to FIG. 8, showing a further modification.

DETAILED DESCRIPTION

The principles of the present invention are particularly useful when embodied in a crimping apparatus as shown in FIG. 1, generally indicated by the numeral 10.

The crimping apparatus 10 comprises a pair of upper and lower rolls 11, 12 cooperating in exerting pressure on textile fibrous materials 13 passing therebetween along a longitudinal path, and a stuffing box 14 disposed downstream of and adjacent to the rolls 11, 12 for crimping the textile fibrous materials 13 supplied therein by the rolls 11, 12. The textile fibrous materials 13 to be crimped include filaments, yarns, tows for staple fibers and the like.

The lower roll 12 is fixedly mounted on a shaft 15 adapted to be driven by a suitable drive means (not shown) to rotate the roll 12 at a predetermined peripheral speed. The upper roll 11 is rotatably mounted on a shaft 16 which is movably supported for vertical movement toward and away

from the shaft 15 to adjust a nipping clearance 17 between the rolls 11, 12.

The stuffing box 14 is in the form of a substantially hollow rectangular box with opposite ends open for the passage therethrough of the textile fibrous materials 13. The box 14 is composed of a pair of upper and lower doctor blades 18, 19 and a pair of side plates 20, 21 disposed one on each side of the superposed doctor blades 18, 19 to define jointly therewith a stuffing chamber 22. Each of the doctor blades 18, 19 has, at one end adjacent to a corresponding one of the rolls 11, 12, an arcuate end surface 23 complementary in contour with the peripheral surface of the corresponding roll 11, 12 and facing to the same with an arcuate clearance 24 therebetween. The arcuate end surface 23 and a flat inner surface 25 of each doctor blade 18, 19 jointly define a knife-edge 26 which serves to scrape the textile fibrous materials 13 off the peripheral surface of the respective roll 11, 12 while the latter is rotated. The lower doctor blade 19 is fixed in position while the upper doctor blade 18 is movable in both horizontal and vertical directions so as to keep the arcuate clearance 24 constant when the upper roll 11 is vertically displaced with respect to the lower roll 12.

The side plates 20, 21 are secured to opposite side surfaces of the stationary lower doctor blade 19 with clearances 27 therebetween. Alternatively, the side plates 20, 21 may be sealingly connected to the side surfaces of

the lower doctor plate 19. Each side plate 20, 21 has a tapered extension 28 projecting beyond the end surface 23 of the doctor blade 18, 19 and having an inner surface 28' extending parallel to one of opposite end surfaces 29 of the respective rolls 10, 11 with a clearance 30 therebetween. The inner surface 28' has a pair of arcuate peripheral portions 31, 31 confronting to opposed inner peripheral portions of corresponding ones of the end surfaces 23 and blending together over the nipping clearance 17 between the rolls 11, 12. The clearances 30 and the arcuate clearances, 24 jointly constitute a substantially annular clearance surrounding the opposite inner peripheral portions of the rolls 11, 12.

As shown in FIGS. 3 and 4a, the upper doctor blade 18 has a transversely extending through-hole 32 adjacent to the arcuate end surface 23, a blind-hole 33 communicating at one end with the through-hole 31 and having another end adapted to be connected to a source (not shown) for supplying a pressurized fluid, and a transversely extending slot 34 opening at one side to the arcuate end surface 23 along the length thereof and at the other side to the through-hole 31. As shown in FIG. 4b, the doctor blade 18 may be provided with a series of orifices 35 instead of the slot 34, each of the orifices 35 opening at one end to the arcuate end surface 23 and the opposite end to the through-hole 32. A stream of pressurized fluid supplied by the source flows through the holes 33, 32 and the slot 34

- 7 -

or the orifices 35 into the arcuate clearance 24. As shown in FIG. 3, the slot 34 (and also the orifices 35 not shown) is spaced from the knife-edge 26 at a distance substantially equal to or smaller than one-third of the width of the arcuate end surface 23 so that the stream of pressurized fluid can flow mostly into the interior of the stuffing-box 14 along the peripheral surface of the roll 11, thereby enhancing scraping effect of the knife-edge 26. Thus the textile fibrous materials 13 are prevented from wedging into the clearance 24 while they are fed by the rolls 11, 12 into the stuffing box 14 even at a speed of 1000 m/min.

The pressurized fluid then flows downstream of the stuffing chamber 22 through the textile fibrous materials 13 crimped therein and escapes from the stuffing box 14. As the textile fibrous materials 13 as having been crimped occupy a 30 - 40 percent of the entire space within the stuffing chamber 22, the pressurized fluid can pass smoothly through the stuffing chamber 22 without increasing the pressure in the stuffing box 14. Since the lower doctor blade 19 is a mirrorimage of and functionally the same as the upper doctor blade 18, no explanation thereon is needed.

The textile fibrous materials while being fed are also prevented from wedging into the clearances 27 between the doctor blade 18 and the side plates 20, 21 by means of streams of pressurized fluid injected from the opposite

- 8 -

ends of the through-hole 32 into the clearances 27, 27. As shown in FIGS. 4a and 4b, each of the side plates 20, 21 has a respective through-hole 36 opening at one end to the clearance 27 and having an another end adapted to be connected to the source of pressurized fluid. A stream of pressurized fluid supplied through the through-hole 36 into the respective clearance 27 also prevents the textile fibrous materials 13 from entering into the clearance 27 while the latter is crimped in the stuffing-box 14. Preferably, the through-hole 36 is disposed closely to the knife-edge 26 and is spaced from the general plane of the inner surface 25 of the doctor blade 18 by a distance which is substantially equal to or smaller than one-third of the width of the side surface of the doctor blade 18.

Modified side plates 38, 38 are shown in FIGS. 5 and 6 each have a channel 39 for the passage therethrough of a stream of pressurized fluid. The channel 39 has a pair of outlets 40, 40 respectively opening to a pair of arcuate peripheral portions 41, 41 of the inner surface 42 of each side plate 38. The outlets 40, 40 are disposed one on each side of the nipping clearance 17 and each spaced from a respective inner edge of the peripheral portion 41 by a distance which is substantially equal to or smaller than one-third of the width of the peripheral portion 41. The channel 39 has an outlet opening to the outside of the side plate 38 for fluid communication with a source (not shown) of a pressurized fluid. Each side plate 38 has a

blind-hole 43 opening at one end to the inner surface 42 and communicating at the opposite end with the channel 39. The blind-hole 43 is functionally the same as the through-hole shown in FIGS. 3 - 6 at the numeral 36.

As shown in FIGS. 7 and 8, a modified side plate 44 includes a base member 45, and a jacket member 46 mounted on the base member 45. The jacket member 46 has an enlarged head 47 and a stem 48 extending perpendicular to the head 47. The head 47 has a shape substantially the same as the shape of the converging end portion of the side plate 38 shown in FIG. 6, and the stem 48 extends through a hole in a bracket 49 secured to the base member 45. A compression spring 50 fits over the stem 48 and is disposed between the bracket 49 and the head 47 to urge the latter to the rolls' end surfaces 29, 29. A channel 51 extends continuously through the head 47 and the stem 48 and has at one end a pair of outlets 52 (only one shown) opening respectively to a pair of arcuate peripheral portions of an inner surface of said head 47. The outlets 52 are disposed one on each side of the nipping clearance 17 and each spaced from a respective inner edge of each peripheral portion by a distance substantially equal to or smaller than one-third of the width of said peripheral portion. Streams of pressurized fluid injected from the outlets 52 form a thin layer of the pressurized fluid between the opposed surfaces of the head 47 and the rolls 11, 12 so that the the head 47 and the rolls 11, 12 are prevented

from being worn away at the opposed surfaces.

FIG. 9 shows another jacket member 53 similar to the one shown in FIG. 8 at 46 but different therefrom in that the jacket member 53 is mounted to a base member 54 by means of a bolt-and-double nut connection 55 which serves to adjust a clearance between the inner surface of a head 56 and end surfaces 29 of the rolls 11, 12.

Although various minor modifications may be suggested by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon, all such embodiments as reasonably and properly come within the scope of our contribution to the art.

Filing-No.: 83730091.2

Applicant : Polymer Processing Research Institute Ltd.

New claims :

1. An apparatus for crimping textile fibrous materials, comprising:
 - (a) a pair of rolls cooperating in exerting pressure on the textile fibrous materials passing therebetween along a longitudinal path;
 - (b) a stuffing box disposed adjacent to said rolls and having a stuffing chamber for the passage therethrough of the textile fibrous materials, said stuffing box having an end portion surrounding opposite inner peripheral portions of said rolls so as to define therebetween a substantially annular clearance communicating at an inner end thereof with said stuffing chamber; and
 - (c) said stuffing box further having means defining a channel for the passage therethrough of a pressurized fluid, said channel having an outlet opening to said end portion and communicating with said annular clearance, said outlet being spaced from said inner edge of said clearance by a distance substantially equal to or smaller than one-third of the width of said annular clearance.

2. An apparatus according to claim 1, said end portion of said box having a pair of arcuate end surfaces complementary in contour with and respectively facing to the peripheral surfaces of said rolls, and a pair of opposed inner surfaces extending parallel to opposite end surfaces of said rolls, each said inner surface having a pair of arcuate peripheral portions confronting to opposed inner peripheral portions of corresponding ones of said end surfaces and blending together over a

- 2 -

nipping clearance between said rolls, said annular clearance being defined jointly by said arcuate end surfaces, said arcuate peripheral portions of each said inner surface, the peripheral surfaces of said rolls and said opposite inner peripheral portions of said end surfaces of said rolls, said outlet opening to at least one of said arcuate end surfaces and said arcuate peripheral portions of said inner surfaces.

3. An apparatus according to claim 2, said stuffing box comprising a pair of spaced doctor blades and a pair of side plates defining jointly therewith said stuffing chamber, each said doctor blade having one of said arcuate end surfaces, each said side plate having one of said inner surfaces, said channel-defining means comprising a blind-hole extending in at least one of said doctor blades and having one end opening to the outside of said box, and a slot extending transversely across said one doctor blade and opening at one side to respective arcuate-end surface of said one doctor blade, said slot having the opposite side communicating with the opposite end of said blind-hole, said slot being spaced from an inner edge of said arcuate end surface by a distance substantially equal to or smaller than one-third of the width of said arcuate surface.

4. An apparatus according to claim 2, said stuffing box comprising a pair of spaced doctor blades and a pair of side plates defining jointly therewith said stuffing chamber, each said doctor blade having one of said arcuate end surfaces, each side plate having one of said inner surfaces, said channel-defining means comprising a through-hole extending in and transversely across at least one of said doctor blades, a blind-hole having one end communicating with said through-hole and the opposite end opening to the outside of said box, and a series of orifices opening at one end to respective arcuate end surface of said one doctor blade and connected at the opposite end with said through-hole, said orifices being spaced from an inner edge of said arcuate end surface by a distance substantially equal to or smaller than one-third of the width of said arcuate surface.

- 3 -

5. An apparatus according to claim 2, said stuffing box comprising a pair of spaced doctor blades and a pair of side plates defining jointly therewith said stuffing chamber, each said doctor blade having one of said arcuate end surfaces, each side plate having one of said inner surfaces, said channel-defining means comprising at least a pair of holes extending through one of said side plates and respectively opening at one end to said arcuate peripheral portions of the respective inner surface of said one side plate, said holes being disposed one on each side of said nipping clearance and each spaced from a respective inner edge of each said peripheral portion by a distance substantially equal to or smaller than one-third of the width of said peripheral portion.

6. An apparatus according to claim 2, said stuffing box comprising a pair of spaced doctor blades and a pair of side plates defining jointly therewith said stuffing chamber, each said doctor blade having one of said arcuate end surfaces, each said side plate including a base member, and a jacket member mounted on said base member and movable toward and away from corresponding ones of said opposite end surfaces of said rolls, said jacket member having one of said inner surfaces, said channel-defining means comprising at least a pair of holes extending through one of said jacket member and respectively opening at one end to said arcuate peripheral portions of said one inner surface of said side plate, said holes being disposed one on each side of said nipping clearance and each spaced from a respective inner edge of each said peripheral portion by a distance substantially equal to or smaller than one-third of the width of said peripheral portion.

7. An apparatus according to claim 6, including a resilient means acting between said base member and said jacket member

and urging said jacket member against the end surfaces of said rolls.

8. An apparatus according to claim 6, including means for adjusting a clearance between said inner surface of said jacket member and corresponding ones of said opposite end surfaces of said rolls.

9. An apparatus according to claim 2, one of said rolls being fixed in position and the other roll being movable toward and away from said one roll with said nipping clearance therebetween, said stuffing box comprising a pair of spaced doctor blades and a pair of side plates defining jointly therewith said stuffing chamber, one of said doctor blades being fixed in position and having one of said arcuate surfaces facing to the peripheral surface of said one roll, the other doctor blade being movable toward and away from both said one doctor blade and said other roll, each said side plate having one of said inner surfaces.

1/3

FIG. 1

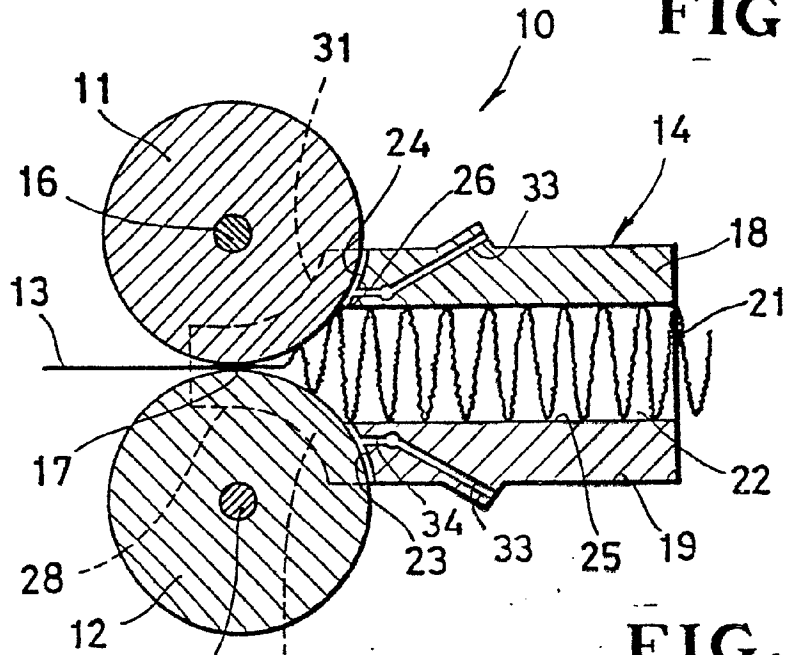


FIG. 2

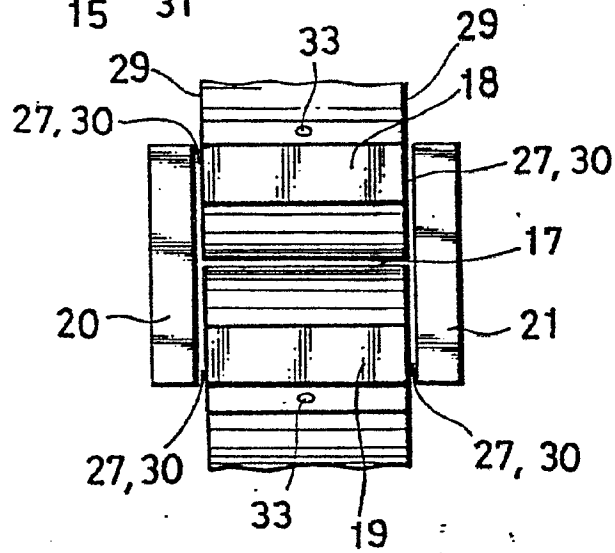


FIG. 3

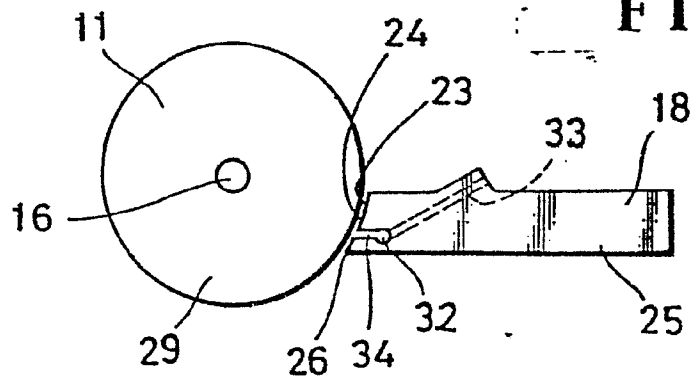


FIG. 4 a

20108705
2/3

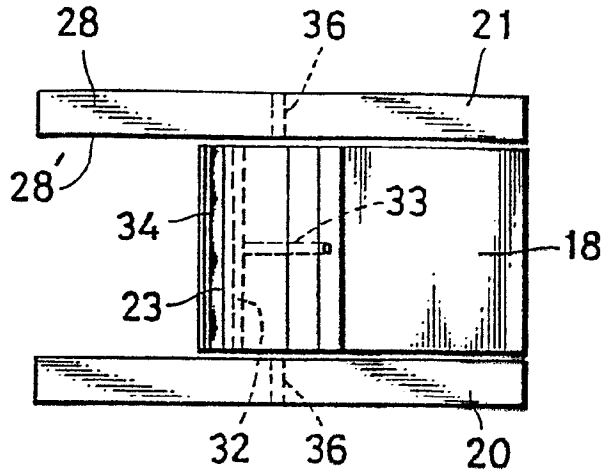


FIG. 4 b

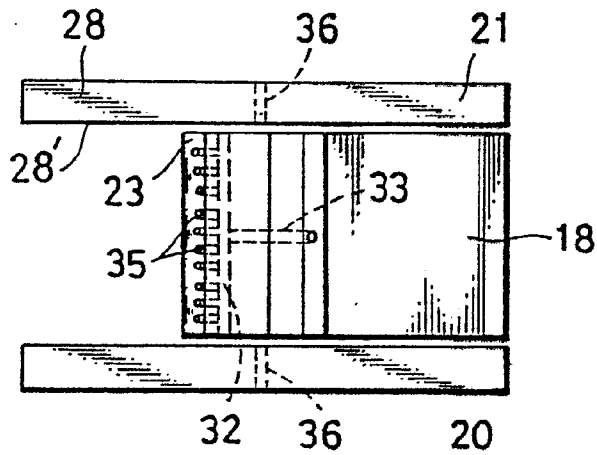


FIG. 5

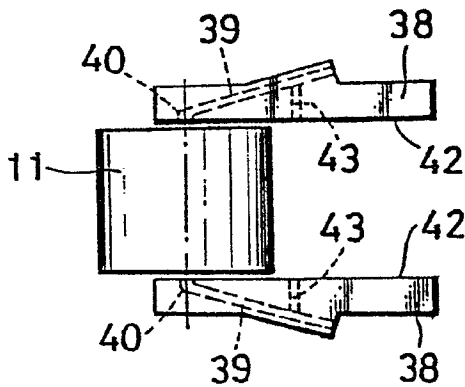
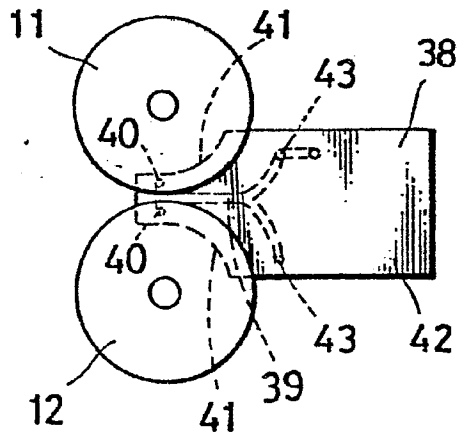


FIG. 6



3/3

FIG. 7

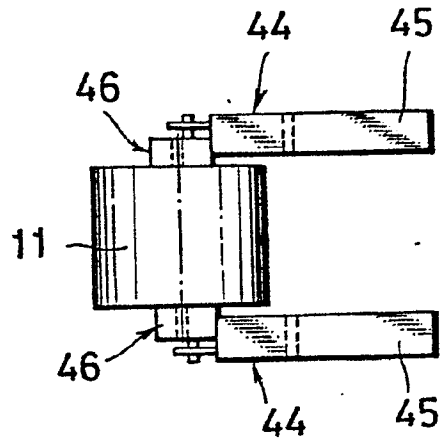


FIG. 8

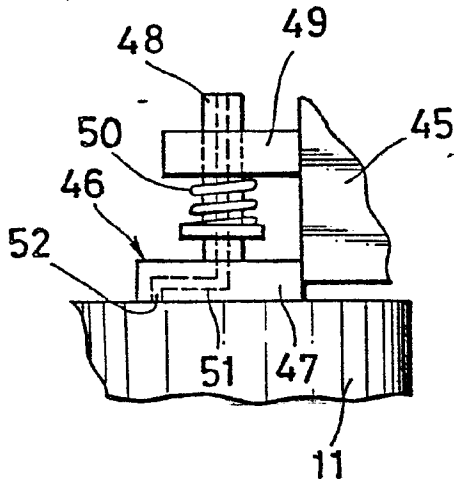
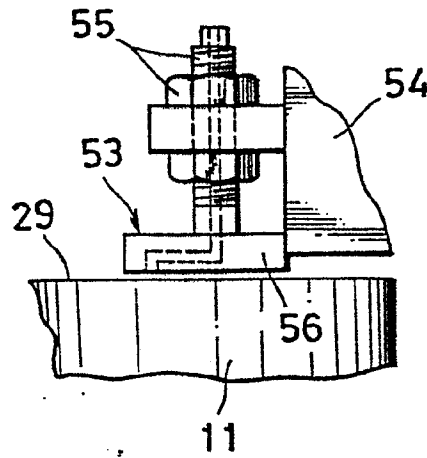
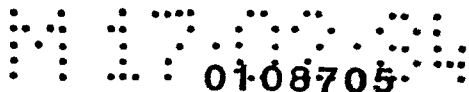


FIG. 9





DIPL.-ING. DIETER JANDER

DR.-ING. MANFRED BÖNING

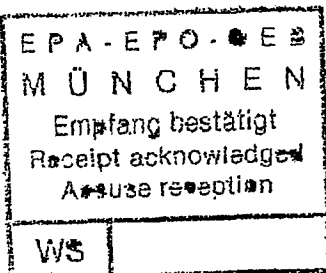
PATENTANWÄLTE
European Patent Attorneys

KURFÜRSTENDAMM 66
1 BERLIN 15
Telefon: 030 / 8 83 50 71 / 72
Telegramme: Consideration Berlin

Europäisches Patentamt

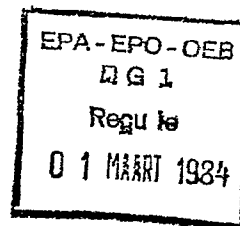
Erhardtstr. 27

8000 München 2



15th February 1984

979/19 357 EU



Filing-No.: 83730091.2

Applicant : Polymer Processing Research Institute Ltd.

With reference to the Office Action of December 9, 1983

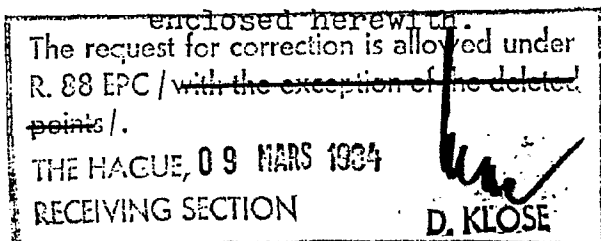
It is requested to carry out the following alterations in the original version of the claims applied for:

Claim 3, last line: insert between "or smaller than" and "the width": "one-third of".

Claim 4, line before last: insert between "or smaller than" and "the width": "one-third of".

Claim 7, in the end: replace "member against said base member" by: "member against the end surface of said rolls".

The new corrected claims (without reference numerals) are



Patentanwälte
Dipl.-Ing. Dieter Jander
Dr.-Ing. Manfred Böning

Claims

DJ:SM

Postcheckkonto Berlin West Konto 1743 84 - 100

Berliner Bank AG., Konto 01 10921 900