

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 82303602.5

(51) Int. Cl.³: **D 02 G 1/12**
D 02 G 1/16, D 02 G 1/20

(22) Date of filing: 09.07.82

(30) Priority: 28.07.81 GB 8123176

(43) Date of publication of application:
09.02.83 Bulletin 83/6

(84) Designated Contracting States:
BE DE GB IT

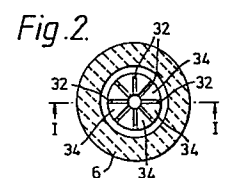
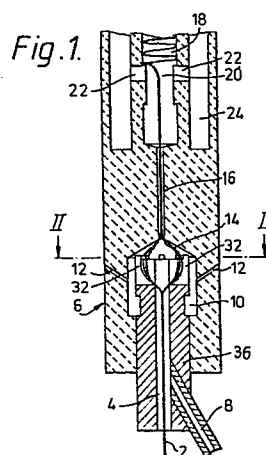
(71) Applicant: **JAMES MACKIE & SONS LIMITED**
Albert Foundry P.O.Box 49
Belfast Northern Ireland BT12 7ED(GB)

(72) Inventor: **McDonald, William James**
35 Fort Road Helen's Bay
County Down Northern Ireland(GB)

(74) Representative: **Jennings, Guy Kenneth et al,**
GILL JENNINGS & EVERY 53/64 Chancery Lane
London WC2A 1HN(GB)

(54) Texturising thermoplastic yarn.

(57) Texturising apparatus comprises a yarn feed passage 1 leading to an expansion chamber 10 formed with bleed openings 12 and in which the pressurised gas or fluid passing along the feed passage 1 with the yarn 2 expands laterally to increase the cross section of the yarn. The cross section of the yarn is then reduced again as it enters a discharge passage 16 leading to a crimp chamber 20 in which the yarn is folded upon itself under pressure. The improvement lies in the fact that the expansion chamber 10 has three or more laterally extending passageways 34 into which the filaments of the yarn are forced by the expansion of the fluid or gas, thus greatly enhancing the crimp.



Case no: 10/2002/02

James Mackie & Sons Limited

- 1 -

Texturising thermoplastic yarn

This invention relates to the texturising of multi-filament thermoplastic yarn by forwarding it by means of a hot gas or fluid into a crimp chamber in which the yarn is folded upon itself to form a crimp plug. The chamber is commonly formed with vents through which the gas or fluid can escape after projecting the incoming yarn against the base of the plug. The formation of successive layers of the plug forces the plug through the crimp chamber and the thus crimped yarn is drawn off from the opposite end of the plug to that which it is fed. Such yarn withdrawal can occur while the plug is still within the chamber or the plug as a whole may be forced right through and beyond the chamber before the crimped yarn is pulled from it.

Various methods have been used for controlling the length of the plug. For example, the feed or withdrawal rate of yarn to or from the plug may be varied in accordance with the length of the plug, or, in a more recent innovation, the temperature of the gas or fluid which forwards the yarn through the assembly may be altered in accordance with the length of the plug or the speed

- 2 -

of the plug as a whole through the chamber.

5. An expansion chamber may be provided between the yarn feed passage and the crimp chamber whereby the high pressure fluid or gas which impregnates the yarn during its forward travel is suddenly permitted to expand laterally, hence bulking the yarn by increasing its cross sectional area. This bulked yarn is then contracted again as it is further propelled through a discharge
10. passage leading from the expansion chamber to the crimp chamber, this passage being smaller in cross sectional area than that of the opened yarn. Apparatus operating in this way is disclosed in British patent specification no: 1,342,484.

15. As a result of the yarn being opened by the expanding gas or fluid and then forced over the edge of the entrance of the restricted passage between the expansion chamber and the crimp chamber, some of the filaments which make up the yarn are
20. individually crimped to some extent before the yarn as a whole is crimped by folding upon itself against the base of the crimp plug. The crimping of the individual filaments may be augmented by the effect of the yarn being impacted against the wall of the
25. chamber opposite to the exit of the feed passage.

According to the present invention, in texturising apparatus of the kind referred to, that is to say comprising a yarn feed passage leading to an expansion chamber formed with a bleed opening
30. and in which the pressurised gas or fluid expands laterally to increase the cross section of the yarn prior to its cross section being reduced again as

- 3 -

- it enters a discharge passage leading to a crimp chamber in which the yarn is folded upon itself under pressure, the crimp in the yarn is enhanced by including in the expansion chamber three or
5. more laterally extending passageways into which the filaments of the yarn are forced by the expansion of the fluid or gas prior to the reduction of the cross section of the yarn as it enters the discharge passage leading to the crimp chamber. The provision
10. of two such diametrically opposed passageways is disclosed in the patent specification referred to above, particularly in Figure 4 of the drawings, but such configuration has been found to maintain the expanded filament bundle in a relatively compact narrow fantail. Hence an increase in the number
15. of passageways even from two to three produces a marked increase in the enhancement of the crimp and a larger increase in the number, e.g. to six or seven or more, leads to a dramatic degree of enhancement.
20. Preferably the separation members between adjacent passageways, e.g. in the form of walls or pillars are shaped with distinct corners to provide additional edges capable of producing an edge crimping effect on the filaments making up the yarn. The
25. rubbing of the filaments over the surface or surfaces of the separation members as the filaments are forced down the passageways, thus causes a significant number of the filaments to be individually edge crimped and thus contributes to the overall enhance-
30. ment of the crimp.

Apparatus in accordance with the invention will now be described in more detail with reference

to the accompanying drawings, in which:-

Figure 1 is a diagrammatic sectional view on the line I - I in Figure 2 of the lower part of the apparatus;

5. Figure 2 is a sectional view on the line II - II in Figure 1 illustrating the internal structure of an expansion chamber;

Figure 3 is a view corresponding to Figure 1 of a modified form of structure;

10. Figures 4 and 4A are an axial section and plan view respectively of another modified form of structure;

Figure 5 is a sectional view similar to Figure 1 of a further form of structure;

15. Figures 6, 6A and 6B are a sectional view similar to Figure 1, a detail view and a plan view of yet another modified form of structure; and

20. Figures 7 and 7A are a sectional view similar to Figure 1 and an elevation of a further modification of the structure.

- Referring first to Figure 1, a
filamentary yarn 2 is fed by means, not shown, to
a feed passage 4 of texturising apparatus shown
generally as 6. High pressure steam or gas
is also fed through a channel 8 from a feed source
by way of temperature control means, not shown.
On leaving the feed channel the yarn is opened by
the sudden expansion of the steam within an
expansion chamber 10 which has controlled bleed-
off openings 12. The filaments of the opened
yarn impact against a domed top wall 14 of the
25.
30.

- 5 -

expansion chamber and are then brought together again as the yarn is propelled by the steam through a discharge passage 16 to a stuffer crimp chamber 18, where the yarn is folded on itself to form a crimp plug 28. The lower end 20 of the chamber 18 is provided with lateral ports 22 opening into a jacket 24.

5.

The upper part of the apparatus is not illustrated but is substantially in accordance with Figure 1 of the British patent specification referred to above.

10.

Although reference is made to the upper part of the apparatus, the attitude is in no way critical and the apparatus as a whole may be inverted or be positioned horizontally in which case appropriate restraining means, e.g. a leaf spring, can be incorporated in the assembly towards its exit end so as to engage the side of the plug and prevent it tumbling out of the apparatus in an uncontrolled manner.

15.

20.

The novel feature of the present invention lies in the configuration of the structure within the expansion chamber 10. It will be observed that the feed passage 4 is formed in a component 36 which is shaped at its upper end with a number of spaced pillars 32 which form passageways 34. This can best be understood by reference to Figures 2 and 3, which are plan views of the tops of two alternative forms of component 36 which have a side elevation in accordance with that illustrated in Figure 1.

25.

30.

- 6 -

As the yarn 2 approaches the end of the feed passage 4 the sudden controlled expansion of the steam causes the filaments of the yarn to separate in a radial direction and hence they balloon outwardly through the passageways 34. The pillars 32 are formed with distinct corners and as the filaments balloon they are rubbed against the or some of the corners of the pillars and in so doing a considerable number of the filaments are individually edge crimped. This, of course, is further enhanced by the filaments being impacted and buckled against the dome 14 of the expansion chamber and then being subjected to a further rubbing as they engage the edge of the entrance to the conduit 16.

The provision of a relatively large number of radial passageways (e.g. eight in Figures 2 and 3) by comparison with the two passageways previously referred to, allows the steam to expand radially outwardly and hence the yarn is opened out into a greater number of filament groups with less filaments in each group and hence there is a correspondingly greater likelihood of more filaments being individually rubbed. As a result the overall texturising of the yarn is greatly improved.

In the modification of Figures 4 and 4A, the top of the component 36 is shaped to define pillars 32' which are spaced radially from the exit of the feed passage 4, thus enabling

- 7 -

the provision of a greater number of pillars and passageways, twelve as illustrated. The passageways 34 are shorter than in Figures 2 and 3, but the edge crimping effect is obtained.

5. Figure 5 illustrates a construction in which the component 36 is provided with a ring of individual pins 32" which are inclined inwardly in the direction of doming of the expansion chamber 10. The passageways defined by the spaces between the pins are again rather short but will nevertheless open up the fibre bundle. The pins are preferably square in section.

15. In the construction illustrated in Figures 6, 6A and 6B a shaped ring 38 housed in the expansion chamber on top of the component 36 is formed with inclined fingers 40 which define the walls of the passageways 34. As will be observed from Figure 6, a gap 42 is left between the top of the fingers and the dome 14 of the expansion chamber and the bleed holes 12 diverge upwardly and outwardly from this gap. The provision of the gap ensures that the expansion will be outwardly in a radial direction from the exit of the feed passage 4 through all of the passageways 34.

25. In the final construction illustrated in Figures 7 and 7A, the top of the component 36 is recessed so as to provide a circular wall 46 and the passageways comprise openings in the wall
- 30.

- 8 -

in the form of vertical slots. Since the passageways are closed at their tops, additional drag is exerted on the yarn and in order to prevent this being excessive, the tops of the slots are sloped as seen at 44.

5.

In each example the separation members are or may be defined by the upper part of the component 36. This component may be made inter-changeable thus enabling any required degree of bulking to be obtained depending on the nature of the yarn and the purpose for which it is intended.

10.

15.

20.

25.

30.

C L A I M S

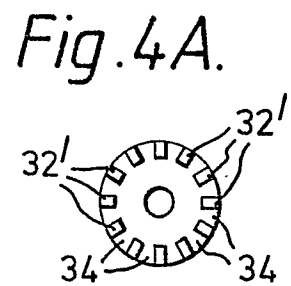
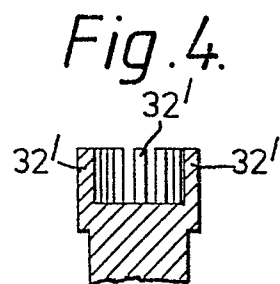
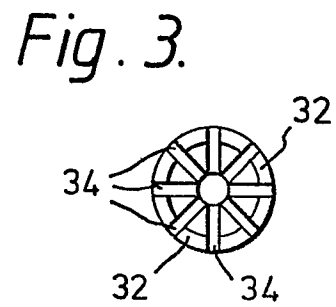
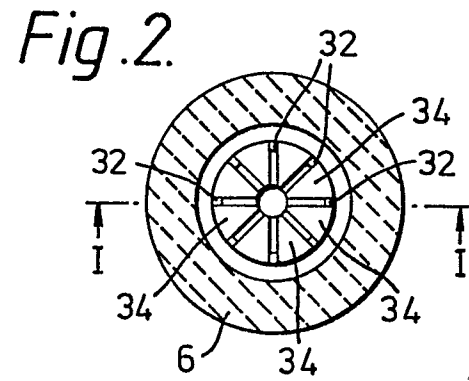
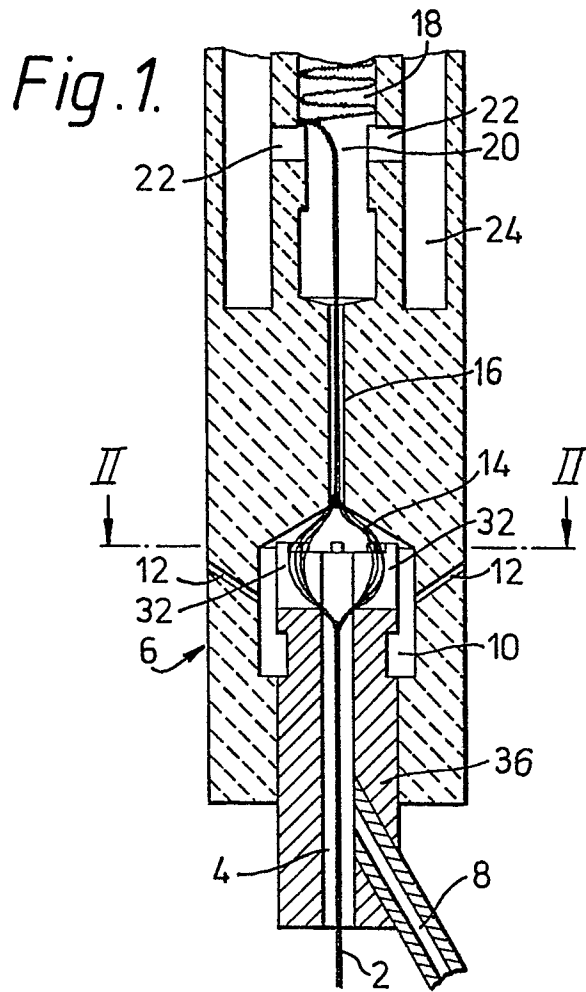
1. Apparatus for texturising thermoplastic multi-filament yarn comprising a yarn feed passage leading to an expansion chamber formed with a bleed opening and in which pressurised gas or fluid
5. passing along the feed passage with the yarn expands laterally to increase the cross section of the yarn prior to its cross section being reduced again as it enters a discharge passage leading to a crimp chamber in which the yarn is folded upon itself
10. under pressure, characterised in that the expansion chamber has three or more laterally extending passageways into which the filaments of the yarn are forced by the expansion of the fluid or gas prior to the reduction of the cross section of
15. the yarn as it enters the discharge passage leading to the crimp chamber.
2. Apparatus according to claim 1 in which the expansion chamber is divided into at least six laterally extending passageways.
20. 3. Apparatus according to claim 1 or claim 2 in which separation members between adjacent passageways are shaped with distinct corners to provide an edge-crimping effect on the filaments.
4. Apparatus according to any one of the
25. preceding claims in which the passageways are defined between spaced pillars.
5. Apparatus according to claim 4 in which the pillars are spaced radially outwardly from the exit of the feed passage.
30. 6. Apparatus according to claim 4 or claim 5 in which the pillars are formed integrally with a

- 10 -

component forming the wall of the feed passage.

7. Apparatus according to claim 1 or claim 2 in which the passageways are defined between pins which are inclined inwardly in the direction of travel of the yarn.
5. 8. Apparatus according to any one of claims 1 to 3 in which the passageways are defined between inclined fingers extending from a common ring and shaped to leave a space between the outer sides of the fingers and a domed end to the expansion chamber, from which space the bleed opening diverges.
10. 9. Apparatus according to any one of claims 1 to 3 in which the passageways are formed as openings in a circular wall within the expansion chamber.
15. 20. 25. 30.

1/2



2/2

Fig. 5.

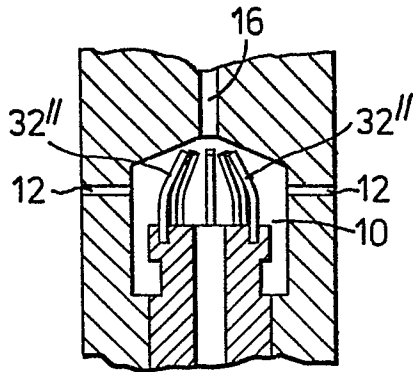


Fig. 6.

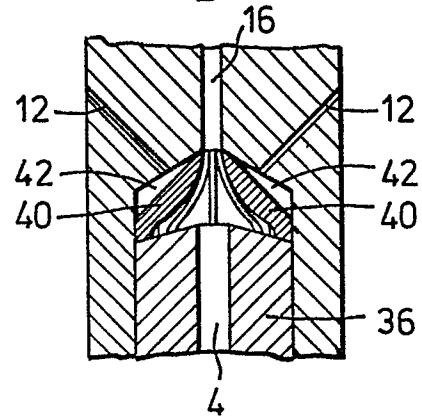


Fig. 6A.

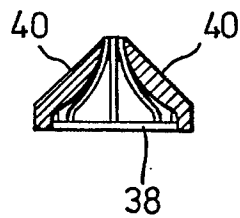


Fig. 6B.

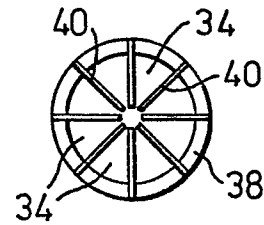


Fig. 7.

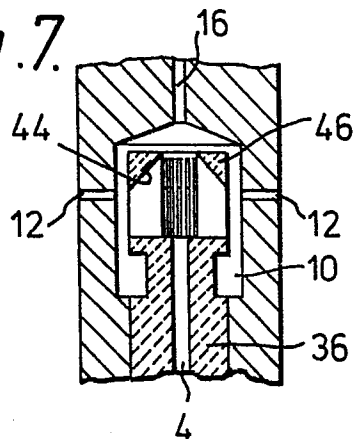


Fig. 7A.

