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

(11) Publication number: **0 067 701**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 82303076.2

(51) Int. Cl.³: D 02 G 3/36

(22) Date of filing: 14.06.82

(30) Priority: 15.06.81 GB 8118327
14.01.82 GB 8200996

(43) Date of publication of application:
22.12.82 Bulletin 82/51

(84) Designated Contracting States:
BE DE FR GB

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

(72) Inventor: Hunt, Robert John
62 Limehill Road
Lisburn County Antrim Northern Ireland(GB)

(72) Inventor: Hill, Norman Ash
14 Hillside Crescent Stranmillis Road
Belfast Northern Ireland BT9 5EN(GB)

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

(54) Wrap spinning device and method.

(57) Textile core material 12 passes from delivery rollers 8, 10 through a rotary spindle 16 and then via take-up rollers 24, 26 to a winding roller 32 to form a package 34. The spindle 16 carries a package 28 of wrapper yarn 27 which is withdrawn over-end and passes down the spindle 16 with the core material 12, wrapping around the latter to form wrap-spun yarn. Positive false twist is applied at the entrance to the spindle 16 by a false twist device 14 spaced from the delivery rollers 8, 10 by a distance A and from the take-up rollers 24, 26 by a distance B. A and B are so related that neither is less than one third of the total A + B and are preferably approximately equal to one another.

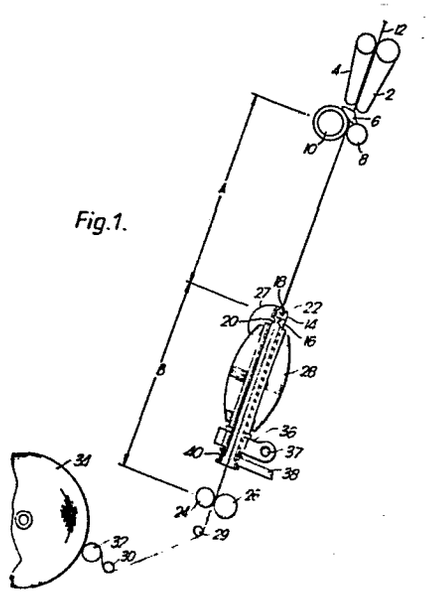


Fig.1.

EP 0 067 701 A1

GJE/181/78

TITLE MODIFIED
see front page

James Mackie & Sons Limited

Production of yarn

This invention relates to wrap spinning, that is to say a spinning process in which a core of textile material is passed through a rotary spindle carrying a package of wrapper yarn which is withdrawn over-end from the package and is wound around the core as a result of the rotation of the spindle so as to bind the core together to form a coherent yarn. The core material may take various forms, but is most commonly constituted by a sliver delivered directly from a drawing head so that the fibres proceed directly from the delivery rollers of the head to the rotary spindle. The wrapper yarn may comprise, for example, mono- or multi-filaments, tapes or natural or synthetic yarn.

Wrap yarn produced in this way can be used for a variety of purposes and its characteristics can be varied as required. For example, effect yarns can be produced by over-feeding an effect component in parallel with the core material through the rotary spindle.

The apparatus necessary for carrying out such a process comprises delivery rollers, a take-up roller or rollers, a hollow spindle which serves as a support for a package of wrapper yarn, being located between the delivery and take-up rollers, and mounted for rotation about its axis, and a drive for the spindle.

One of the main variables in the process is the application of false twist to the core so as to hold it together during wrapping. This false twist may be applied by frictional engagement of the core material with the hollow interior of the rotary spindle. If there is no or little slip, the number of turns of false twist applied may be considerably greater than the number of turns of the spindle, but the degree of slip and hence the degree of false twist applied is largely unpredictable under any particular operating conditions.

As an alternative, therefore, a device may be included for the specific purpose of applying the false twist. Such a device preferably rotates at the same speed as the spindle so as to impart one-to-one false twist to the core material and by engagement with the core material curtails relative rotation between the device and the material at the point of engagement. The false twist applied will be referred to as positive false twist and it is with this type of false twist that the present invention is concerned.

The false twist in the core material extends away from the false twist device in both directions along the core material until it reaches a point in either direction at which it is blocked. This blocking is most commonly caused by the delivery rollers for the core material at the upper end and by the take-up rollers for the wrapped yarn at the lower end, but other forms of device included in the path of the core material may have a similar effect and may block the false twist

from reaching either or both the pairs of rollers just referred to.

We have found that the quality of the yarn produced varies to an appreciable extent in accordance with the location of the rotary false twist device along the length of the core material between the two twist-blocking points and according to the invention, the distance of the false twist device from either of these points is not less than one third of the path length of the core material between the points in question. In other words, the false twist device is located within the middle third of the path length of the core material between the blocking points and it is found that this leads to a yarn having particularly uniform properties, particularly tensile strength and overall appearance. The best results are achieved when the false twist device is located approximately mid-way between the twist-blocking points.

This principle is applicable to both single and double wrapped yarn, but is particularly valuable when applied to a single-wrapped yarn where regularity in the laying-up of the fibres of the core material is most important. When producing single-wrapped yarn and thus using only a single rotary spindle, it is found preferable for the false twist device to be at the entry end of this spindle and to be fitted to the spindle to rotate with it. The result of this is that wrapping occurs immediately at the entry end of the spindle and the two components, i.e. the core and the wrapper yarn, will immediately be wrapped together in the same hand and passed

down through the spindle in that wrapped state.

It is also possible for the false twist device to be located at the exit of the spindle and again it is preferably fitted to the spindle itself so as to rotate with it although it is possible for the false twist device to be separate from the spindle and to be positively rotated in the same direction as the spindle.

When the overall strength of a yarn is a primary consideration, it may be necessary to apply more than one wrapper yarn by passing the core material in succession through two or more rotary spindles, each of which serves for the application of a wrapper yarn. The invention is also applicable to such double-wrapping and although it will be described in terms of the use of two rotary spindles, it will be understood that more than two such spindles can be used if necessary.

With two spindles arranged so that yarn passes through them in succession, the false twist device is preferably mounted between them and the yarn passes to the delivery rollers without any further false twist device. The novel combination of a first rotary spindle followed by a false twist device and a second rotary spindle with no subsequent false twist device leads to a unique formation of double wrapped yarn which cannot be obtained by any other combination of steps and which has greatly superior properties to previously known forms of double wrapped yarn.

The improved result obtained can best be explained by a brief description of the observed

difference of effect according to whether or not a rotary false twist device is included after a rotary spindle serving to apply wrapper yarn to a core material. If no false twist device is included and the wrapper yarn is applied at the entrance to the spindle, it can be seen to be wrapped around the core material in a relatively close helix, which of course depends on the spindle speed, with the straight line path of the core material being relatively undisturbed, and the two pass through the spindle in this configuration. On the other hand, if the spindle is followed by a rotary false twist device and the wrapper yarn is supplied at the entrance to the spindle, no close wrapping of the core material occurs at all in the region of the entrance to the spindle.

The wrapper yarn merely makes a relatively long helix around the core material, the number of turns representing the turns of unwinding of the wrapper yarn from the package. On the other hand, after leaving the false twist device and the false twist in the core material being reversed, it can be seen that the two components become twisted together, i.e. each component follows its own helical path which is in contrast to the straight line path of the core material when no false twist device is included. The wrapped yarn then passes to take-up rollers and after passing through the nip of the rollers the twist may very slightly relax.

If this observed behaviour is now related to two successive stages of wrapping with a single false twist device located as described, it will be

understood that at the entrance to the first spindle, the wrapper yarn is not bound tightly around the core material, but merely passes down the hollow interior of the spindle in the form of a relatively long helix as previously described. After passage through the false twist device, however, the two components are twisted together, each taking up its own helical configuration. While the twisted core and first wrapper yarn are firmly twisted together between the false twist device and the take-up rollers, they pass into the second spindle and, owing to the absence of any subsequent false twist device, wrapping occurs at the entrance to this spindle and hence the second wrapper yarn is applied while the core and first wrapper yarn are firmly twisted together and before they have had the opportunity to relax.

This is in contrast to the effect obtained using a pair of rotary spindles through which the core material passes in succession, but with a single false twist device following the second spindle rather than the first. Although the difference in the apparatus used and the steps of wrapping applied to the yarn may appear slight, the difference in the result obtained is major. The false twist applied by the false twist device following the second spindle travels back from the false twist device itself through both spindles and up to the delivery rollers. As a result, the first wrapper yarn merely wraps around the core rather than twist with it. After passage through the false twist device, the false twist reverses and the windings

of the first wrapper yarn may significantly relax in places. It is this irregularly wrapped yarn which is then twisted with the second wrapper yarn as they leave the false twist device and the finished product may relax still further after passing through the take-up rollers. As a result small loops of wrapper yarn may appear in the finished yarn which during subsequent use of the resultant yarn may catch on parts of any machinery used, e.g. the needles in knitting and tufting machines. Such a process is disclosed in British patent specification 1,309,185 where, as can be seen from Figure 1, a rotary false twist device follows the second spindle rather than the first.

Although best results are obtained by the use of a single false twist device located between the two rotary spindles, significant advantage can still be obtained by adaptation of an arrangement referred to above for a single rotary spindle, i.e. where the false twist device is located at the entrance to this spindle. Under these circumstances, a separate twist-blocking device needs to be located between the two spindles. The first of the two spindles operates in exactly the same manner as if there were only a single spindle. In other words, the twist blocking device performs a similar function to the take-up roller or rollers which follow a single spindle. After leaving the twist-blocking device, however, the singly wrapped yarn then passes through the second spindle where the second wrapping is applied without the application of any further false twist.

Examples of apparatus in accordance with the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is an elevation of apparatus for producing a single-wrapped yarn with a false twist device mounted at the entry end of a rotary spindle;

Figure 2 is a diagrammatic view of a modification of the apparatus of Figure 1 in which the false twist device is fitted to the exit end of the spindle;

Figure 3 is a corresponding view of apparatus for the production of double-wrapped yarn in which the false twist device is mounted at the entry end of the first of two rotary spindles, the first of these two spindles operating in a manner similar to that illustrated in Figure 1;

Figure 4 is a diagrammatic view similar to Figure 3, but with a false twist device mounted between the two spindles at the exit end of the first spindle; and

Figure 5 is a modification of the view of Figure 4 with the false twist device located at the entry end of the second spindle.

Turning first to Figure 1, the core material shown as 12 is in the form of a sliver supplied by a drafting head comprising a pair of twin aprons 2 and 4 and passing through a conductor 6 to a pair of delivery rollers 8 and 10. The core material 12 passes through a hollow spindle 16 having a false twist device 14 at its top or entry end. This false twist device may be constructed integrally

with the spindle or may be a separate part which is fitted to the top of the spindle, but in either case imparts positive, one-to-one false twist to the core material 12.

The false twist device comprises an entry passage 18 and an exit passage 20 between which is located a transverse pin 22 formed with a V groove for locating the yarn centrally of the pin. The diameter at the bottom of the groove is larger than the bore of either the entry passage 18 or the exit passage 20 so that the sliver is deflected from a straight line path and caused to bear against the walls of the two passages so as to be nipped at these two points. The nipping action must be sufficient to cause the sliver to be false twisted on either side of the pin 22, by curtailing relative rotation between the device 14 and the core material 12, but not great enough seriously to retard the passage of the sliver through the spindle. The resultant false twist on the upstream side of the false twist device will run back to a twist-blocking point defined by the nip of the delivery rollers 8, 10 while the reverse twist on the downstream side will run to a twist-blocking point defined by the nip of a pair of take-up rollers 24 and 26.

A package 28 of filament wrapper yarn is mounted on the spindle 16 so as to rotate with the spindle and the wrapper yarn is drawn off over-end upwardly from the package and then downwardly through the false twist device 14, as seen at 29. On leaving the false twist device 14 the two components i.e. the sliver 12 constituting the core material

and the wrapper yarn 27, are twisted together and are drawn downwardly by the take-up rollers 24, 26, after which the wrapped yarn passes around guide members 29 and 30 and a winding roller 32 to be formed into a wound package 34. The spindle 16 is mounted for rotation in a bracket 36 pivoted at 37 and is driven by a belt 38 passing around a pulley 40 at the lower end of the spindle.

The dimensions A between the false twist device 14 and the upper twist-blocking point defined by the delivery rollers 8, 10 and the dimension B between the false twist device 14 and the lower twist-blocking point defined by the take-up rollers 24, 26 are shown as equal, so that the false twist device 14 is located at the mid-point between the two twist-blocking points. Generally speaking, this leads to best results, but the dimensions A and B can be varied in relation to one another within the limits set out above without any very marked deterioration in the properties of the yarn.

In the modification shown in Figure 2, corresponding parts are indicated by the same reference numerals, and the false twist device which is again shown as 14 is in the form of a bent wire fitted to the bottom of the spindle 16, to impart positive false twist to the core material 12. Again the device 14 is positioned mid-way between the two twist-blocking points represented by the delivery rollers 8, 10 and the take-up rollers 26, 28.

In the apparatus of Figure 3 where the yarn is double-wrapped, the arrangement is the same as that of Figure 1 as far as the exit of the spindle 16,

the core material formed by the sliver 12 and the wrapper yarn 29 passing together through the false twist device 14 at the top of the spindle 16. Below the spindle 16, the wrapped yarn passes to a twist-blocking point defined by pins 23, 25 and having an equivalent effect on the false twist to the take-up rollers 24,26 in Figure 1. Thereafter the yarn passes to a second spindle 40 fitted with a package 42 of wrapper yarn and otherwise similar to the spindle 16 except for the absence of any false twist device at the entrance to the spindle. The wrapper yarn shown as 44 thus wraps around the single wrapped yarn at the entrance to the spindle 40 and the double wrapped yarn emerges at the bottom of the spindle and passes to the take- up rollers 26, 28 before being wound into a package as in Figure 1. As in Figure 1, the dimensions A and B are equal so that the false twist device 14 is located mid-way between the twist-blocking points formed by the delivery rollers 8, 10 and the pins 25, 27 and is located at the top of the spindle 16 in the same way as in Figure 1.

As mentioned previously, the twist-blocking points may be defined either by the delivery and take-up rollers as in Figure 1 or either or both of these points may be defined by some other form of device. In the modification of Figure 3 the lower twist-blocking point is defined by the pins 25, 27 and a similar arrangement of pins could be provided at the upper end, i.e. just below the delivery rollers, if required. Other forms of twist-blocking device are also possible.

Figures 4 and 5 are diagrammatic views of different forms of the preferred apparatus for producing double-wrapped yarn in which the false twist device 14 is mounted between the two spindles, with the improved results previously described. In both these Figures, the parts are identified by the same reference numerals as in Figure 3, and it will be seen that in each case there is a first rotary spindle followed by a false twist device and a second rotary spindle with no subsequent false twist device. For sake of simplicity, the false twist device 14 is shown as being in the form of a bent wire, being fitted to the exit end of the first spindle in Figure 4 and to the entry end of the second spindle in Figure 5.

In each case, the effect of the device 14 is to apply false twist to the core material 12 which passes back as far as the delivery rollers 8 and 10, being illustrated in each of the two Figures by short lengths of the core material 12 which slope downwardly from left to right. As previously explained, the provision of the device 14 means that the wrapper yarn 29 does not wrap around the core material 12 at the entrance to the spindle, but merely passes down the hollow interior of the spindle with the core material 12 in the form of a long helix indicated by the chain dotted lines sloping steeply from right to left. For sake of illustration this helix is shown in Figure 4 as having four turns between the entrance to the spindle 16 and the device 14, these four turns representing the number of turns around the package 28 corresponding to the length of

wrapper yarn 29 which has been withdrawn. After leaving the device 14 in Figure 4, the false twist is reversed in the core as illustrated by the reverse slope of the short lines representing the core material 12 and, as a result, as previously explained, after leaving the device 14 the core material 12 and the wrapper yarn 29 are twisted together as shown by the alternating solid and chain dotted inclined lines. This false twist is maintained as far as the take-up rollers 26, 28 situated below the second rotary spindle 40 which carries the package 42 of the second wrapper yarn 44. As shown, the yarn passes straight through the second spindle 40 although its path may be adjusted to engage either the entrance or the exit of the spindle if required. Owing to the fact that the double wrapped yarn shown as 46 passes directly from the exit of the spindle 40 to the take-up rollers 26, 28, the wrapper yarn 44 wraps around the combination of the core material 12 and the first wrapper yarn 29 at the entrance to the spindle 40 and continues down the spindle 40 in this configuration as illustrated by the continuous thin lines sloping from left to right between the entrance to the spindle 40 and the take-up rollers 12. As can be seen from this, the second spindle 40 is illustrated as rotating in the opposite direction to the first spindle 3 and when operating in this manner, it is found preferable that the false twist device 14 should be fitted to the bottom of the first spindle 16, as illustrated in Figure 4.

When the double wrapped yarn 46 finally leaves the take-up rollers 26, 28 and the false twist disappears, the presence of the second wrapper yarn 44 prevents the appearance of any slack in the turns of the first wrapper yarn 29, leading to a yarn having all the advantages of a double-wrapped yarn, but not the disadvantages.

As illustrated in Figure 5, the spindle 40 is turning in the same direction as the first spindle 16, as can be seen from the fact that the turns of the second wrapper yarn 44 slope from right to left in contrast to those in Figure 4. Under these circumstances, it is preferred that the false twist device 14 is mounted at the entry end of the spindle 40, as illustrated in Figure 5. In both Figures 4 and 5, the false twist device 14 is located approximately mid-way between the delivery rollers 8, 10 and the take-up rollers 26, 28 in the same way as in the other Figures.

As mentioned originally, the core material 12 may be in the form of a sliver formed of synthetic or natural fibres. In a particular example, these natural fibres may be jute which when double-wrapped with nylon filaments bears comparison with a normal spun jute yarn but produced by a simpler and cheaper process. Thus in a particular example of a jute yarn suitable for weaving into a hessian cloth useful for carpet backing or for sacking, the starting material for the core was a jute sliver of 7.84 grams per metre drafted to twenty four of a draft in a drafting head so as to emerge at the delivery rollers 8,10 as a sliver of 3.1 NM leading to a yarn of 3.1 NM.

Both wrapper yarns 27 and 29 were seventy denier nylon mono- or multi-filament. Examination of the product showed that it consisted of a jute core twisted with the first wrapper yarn, the resultant composite being wrapped by the second wrapper yarn.

A process in accordance with the invention is susceptible of all the same variations as a normal wrap spinning process. Although the use of a jute core has been referred to as a particular example, the core may be constituted by any form of textile sliver or other form of bundles of fibres. The process may be readily adapted for the production of an effect yarn by the over-feeding of an effect component as with other wrap spinning processes.

C L A I M S

1. A wrap spinning head comprising delivery rollers, a take-up roller or rollers, a hollow spindle which serves as a support for a package of wrapper yarn, being located between the delivery and take-up rollers and mounted for rotation about its axis, a drive for the spindle and a device for the application of positive false twist to a core material passing through the spindle, the device being located between twist-blocking points at a distance from either twist-blocking point not greater than one third of the path length between the twist-blocking points.

2. A wrap spinning head according to claim 1 in which the false twist device is located approximately mid-way between the twist-blocking points.

3. A wrap spinning head according to claim 1 or claim 2 in which there is a single rotary spindle and the false twist device is fitted to the entry end of the spindle to rotate with it.

4. A wrap spinning head according to claim 1 or claim 2 in which there is a single rotary spindle and the false twist device is located at the exit to this spindle.

5. A wrap spinning head according to claim 4 in which the false twist device is fitted to the spindle to rotate with it.

6. A wrap spinning head according to claim 1 or claim 2 in which there are two spindles arranged so that yarn passes through them in succession, with the false twist device mounted between them and the yarn passing to the take-up roller or rollers without any further false twist device.

7. A wrap spinning head according to claim 6 in which the false twist device is fitted to the exit end of the first spindle.

8. A wrap spinning head according to claim 6 in which the false twist device is fitted to the entry end of the second spindle.

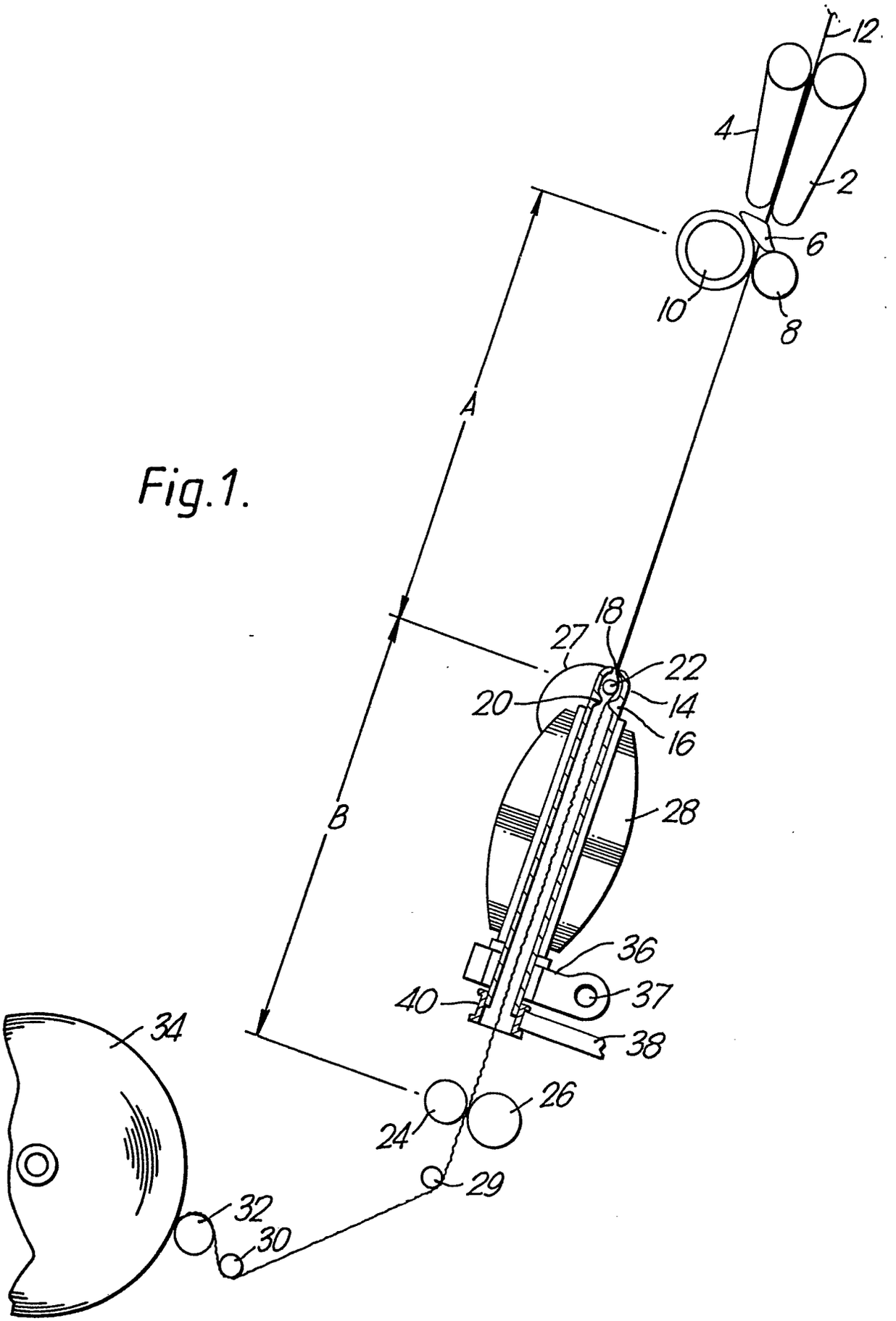
9. A wrap spinning head according to claim 1 or claim 2 in which there are two rotary spindles arranged for yarn to pass through them in succession with the false twist device located at the entrance to the first rotary spindle and a separate twist-blocking device located between the two spindles.

10. A method of wrap spinning in which a core of textile material is passed through a rotary spindle carrying a package of wrapper yarn which is withdrawn over-end from the package and is wound around the core so as to bind the core together and in which positive false twist is applied to the core by a false twist device located between two twist blocking points at a distance from each point not less than one third of the path length of the core material between the two points.

11. A method according to claim 10, in which the false twist is applied to the core approximately mid-way between the two twist blocking points.

12. A method according to claim 10 or claim 11 in which the core passes through two rotary spindles in succession so as to be double-wrapped and the false twist is applied to the core between the two spindles, the yarn then passing to a take-up roller or rollers without the application of any further false twist.

Fig.1.



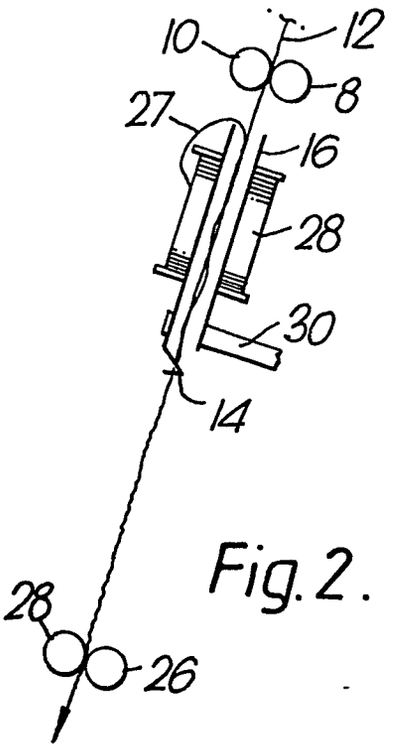

10
12
8
27
16
28
30
14
28
26

Fig. 2.

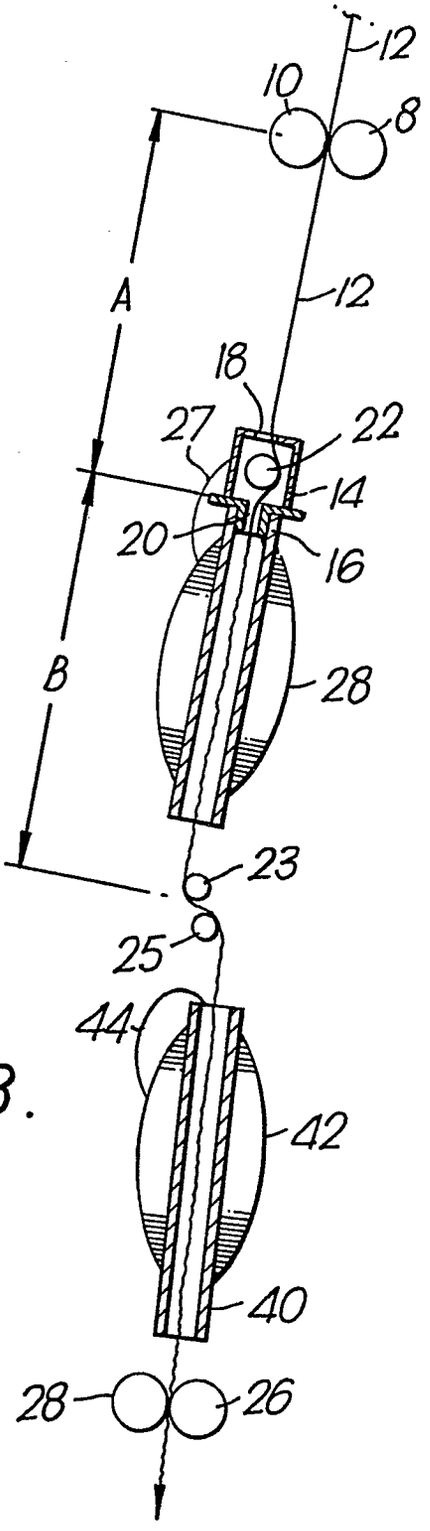

12
10
8
A
12
18
27
22
14
20
16
B
28
23
25
44
42
40
28
26

Fig. 3.

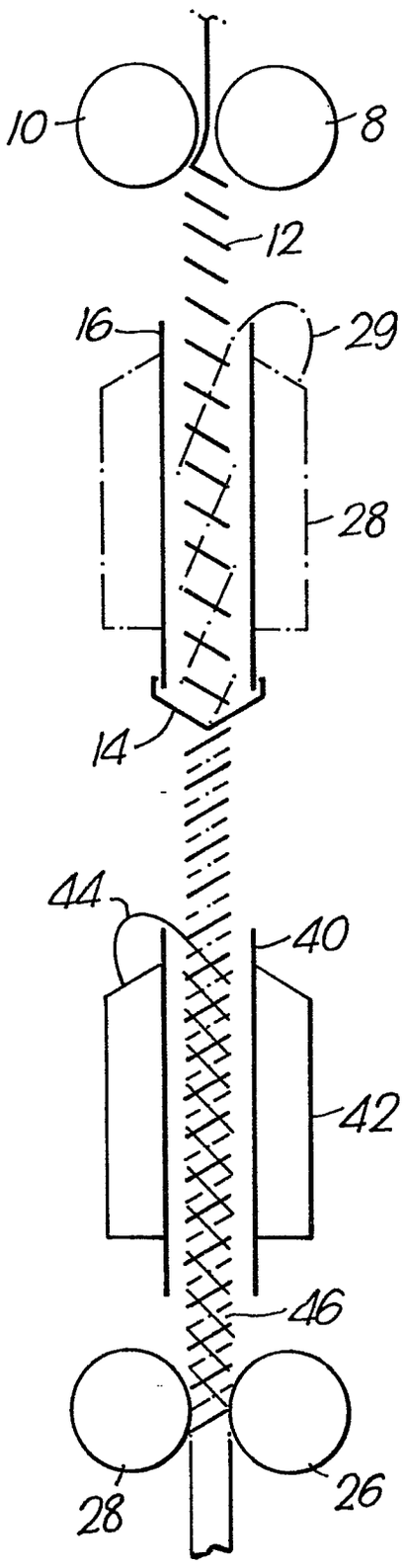


Fig. 4.

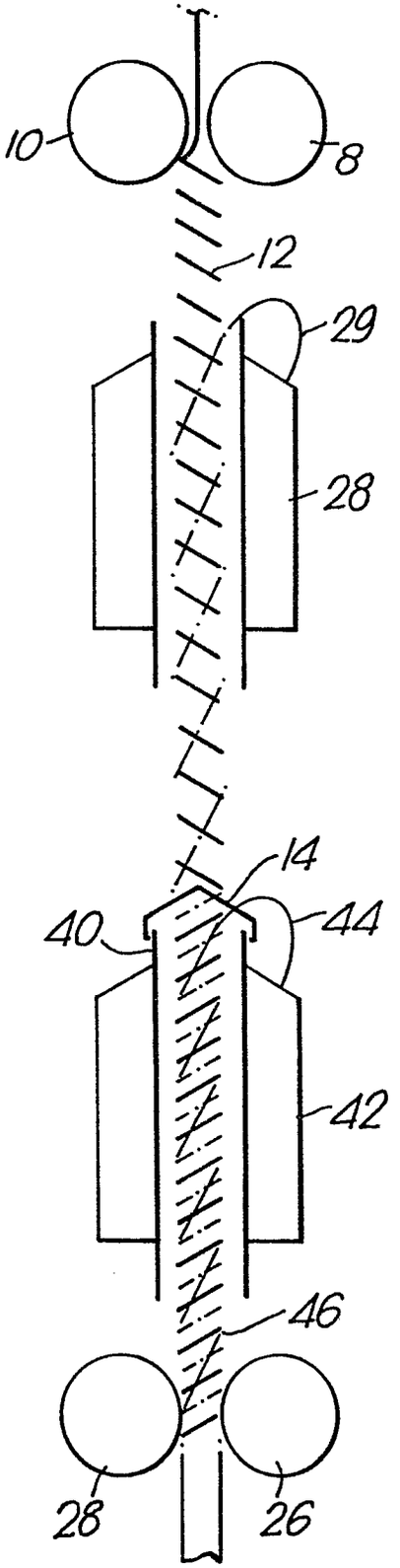


Fig. 5.

European Patent Office

EUROPEAN SEARCH REPORT

0067701 Application number

EP 82 30 3076

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)
A	GB-A-1 603 717 (J.MACKIE) *The whole document*	1,6,10	D 02 G 3/36
A	GB-A-1 600 129 (COURTAULDS) *The whole document*	1,10	
A	FR-A-2 080 051 (MOULINAGE ET RETORDERIE DE CHAVANOZ) *Page 3, lines 24-38; page 4, lines 1-8; figures 1-5*	1,3,4, 10	
D,A	GB-A-1 309 185 (CHAVANOZ) *The whole document*	1,3,4, 10	
A	US-A-4 228 639 (J.MACKIE)		TECHNICAL FIELDS SEARCHED (Int. Cl. ³) D 02 G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22-09-1982	DEPRUN M.

CATEGORY OF CITED DOCUMENTS

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

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

EPO Form 1503 03.82