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

(11) Publication number: **0 394 986 A2**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **90107817.0**

(51) Int. Cl.[5]: **B65H 54/28**

(22) Date of filing: **25.04.90**

(30) Priority: **28.04.89 JP 110133/89**
19.09.89 JP 242761/89

(43) Date of publication of application:
31.10.90 Bulletin 90/44

(84) Designated Contracting States:
CH DE IT LI

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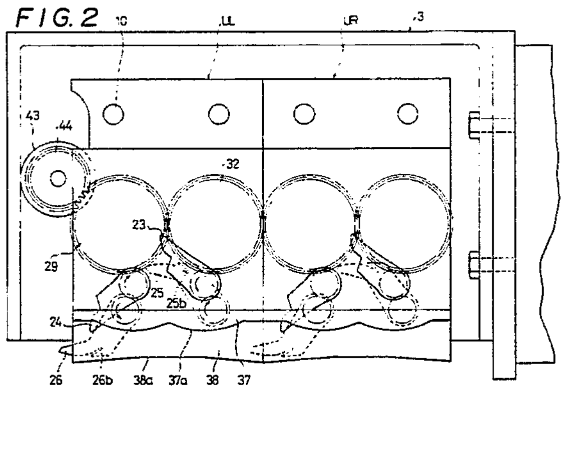
(54) **A yarn traversing apparatus.**

(57) A yarn traversing apparatus comprises:
a first traverse member, which is disposed downstream by a predetermined distance from a fulcrum for traverse motion, for traversing the yarn from a center toward ends of traverse stroke; and
a second traverse member, which is disposed downstream by a predetermined distance from the first traverse member, for traversing the yarn from the ends of traverse stroke toward the center of traverse stroke;
the first traverse member comprising a rotary blade moving from the center of traverse motion toward the ends of traverse stroke and a guide rail restricting a speed of the yarn conveyed by the rotary blade, so that speed of the yarn conveyed by the first traverse member is made substantially constant;
the second traverse member comprising a rotary blade moving from the ends of traverse stroke toward the center of traverse motion and a guide rail restricting a speed of the yarn conveyed by the rotary blade of the second traverse member, so that a speed of the yarn conveyed by the second traverse member is made almost same as that of the first traverse member at the center of traverse motion and is gradually decreased from a speed between 1.5 and 7 times of that of the first traverse member to that of the first traverse member at the ends of traverse motion.

FIG. 2



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A YARN TRAVERSING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates a yarn traversing apparatus for obtaining a wound yarn package with a good wound shape and without cob-webbing at a high speed winding.

More specifically, the present invention relates to a yarn traversing apparatus, which comprises at least one pair of rotary blades which rotate in opposite directions and which apparatus transfer the yarn between the blades.

Conventionally known yarn traversing apparatuses of the above-described type are, for example, disclosed in Japanese Patent Publication No. Sho 53-22178, Japanese Patent Publication No. Sho 46-36258, and Japanese Patent Laid-open No. Sho 59-194977.

However, in these conventionally known apparatuses, a yarn temporarily becomes in a free condition, i.e., the yarn becomes in an unstable condition, when the yarn is transferred from one of oppositely rotating yarn guides to the other yarn guide. Accordingly, there occurs a disadvantage that the obtained yarn quality is deteriorated because high shoulders are formed at ends of the package corresponding to traverse ends.

Further, there occurs another disadvantage, which is sometimes referred to as "cob-webbing" and wherein a yarn wound on the shoulders is slipped down from the shoulders.

In addition, in the conventionally known apparatuses, since a so called "free length", i.e., a distance from the yarn guide to the contact roller, becomes long, and accordingly, there is an inconvenience that the high shoulders occur remarkably.

Besides, in the conventional apparatuses, when a yarn is wound at a high speed higher than 5,000 m/min, the yarn is fluctuated due to the moment of inertia when the traverse motion is reversed, and the above-described disadvantages are remarkable.

Furthermore, in the conventional apparatuses, since a common guide rail is disposed corresponding to rotary blades which are rotating in opposite directions and since the rotary blade rotating in opposite directions are arranged adjacent to each other, the traverse speed cannot be set freely. As a result, the following problems are inherent to the apparatuses.

When the yarn is moved from the center of traverse stroke toward the end of the traverse stroke, the yarn is moved behind the movement of the rotary blade by a distance equal to a distance from the position of the rotary blade to the point where the yarn reaches the contact roller multiplied by tan θ, wherein θ stands for a winding angle. Further, when the traverse motion of the yarn is reversed at the end of the traverse stroke, the winding angle θ is also reversed, and the movement of the yarn in a traversing direction is temporally stopped while the traverse motion is reversed. Thus, high shoulders are generated at the ends of the obtained package. Accordingly, the yarn quality may be deteriorated because of the high shoulders, and cob-webbing may occur due to loosening of the yarn.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a new traversing apparatus, by which the above-described disadvantages are obviated.

It is another object of the present invention to provide a traversing apparatus, by which a yarn is surely traversed and wound in a package without forming high shoulders or cob-webbing.

According to the present invention, the above-described disadvantages are obviated and the above-described objects are achieved by a traversing apparatus for traversing a yarn which is to be wound onto a bobbin to form a yarn package. The yarn traversing apparatus of the present invention is installed in a yarn winding apparatus comprising a bobbin holder for inserting the bobbin thereon, a contact roller pressed onto the bobbin and the yarn traversing apparatus. The yarn traversing apparatus of the present invention comprises:

a first traverse means, which is disposed downstream by a predetermined distance from a fulcrum for traverse motion, for traversing the yarn from a center toward ends of traverse stroke; and

a second traverse means, which is disposed downstream by a predetermined distance from the first traverse means, for traversing the yarn from the ends of traverse stroke toward the center of traverse stroke;

the first traverse means comprising a rotary blade moving from the center of traverse motion toward the ends of traverse stroke and a guide rail restricting a speed of the yarn conveyed by the rotary blade, so that speed of the yarn conveyed by the first traverse means is made substantially constant;

the second traverse means comprising a rotary blade moving from the ends of traverse stroke toward the center of traverse motion and a guide rail restricting a speed of the yarn conveyed by the rotary blade of the second traverse means, so that a speed of the yarn conveyed by the second traverse means is made almost same as that of the first traverse means at the center of traverse motion and is gradually decreased from a speed between 1.5 and 7 times of that of the first traverse means to that of the first traverse means at the ends of traverse motion.

It is preferred that the yarn is released from the first traverse means after the yarn is moved by the second traverse means to a position deviated toward the center of traverse stroke from an imaginary line connecting the first traversing means and a point where the yarn is in contact with the contact roller, when the yarn moved to the end of traverse stroke by the first traverse means is engaged with the second traverse means. In order to move and release the yarn as described above, it is preferred for the yarn traversing apparatus to be so arranged that following equations are satisfied.

$S1 \geqq S0 + 2L1 \tan \theta$

$S2 \leqq S0 + 2L2 \tan \theta$

wherein the parameters are as follows:

S0 stands for stroke of the yarn wrapping around the contact roller;

S1 stands for stroke of the first traverse means when it releases the yarn;

S2 stands for stroke of the second traverse means at that time;

L1 stands for a distance from the first traverse means to the wrapping point on the contact roller;

L2 stands for a distance from the second traverse means to the wrapping point on the contact roller; and

θ stands for a winding angle of the yarn.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be explained in detail with reference to the accompanying drawings, wherein:

Fig. 1 is a schematic front view of a winding apparatus wherein the traversing apparatus of the present invention is installed;

Fig. 2 is a plan view showing the traversing apparatus according to an embodiment of the present invention;

Fig. 3 is a detailed cross sectional view of a traverse unit in Fig. 2;

Figs. 4 and 5 are front views, sequentially showing the conditions wherein a yarn is transferred while it is traversed;

Figs. 6 (a) to 6 (c) are schematic plan views showing the shapes of blades 25 and 26 and transfer of the yarn;

Figs. 7 (a) to 7 (f) are diagrams showing the relationships between the speed ratio of the rotary blades and the traverse stroke;

Figs. 8 (a) to 8 (f) are diagrams corresponding to Figs. 7 (a) to 7 (f) and showing the relationships between the width of packages and the hardness of the packages;

Figs. 9 (a) to 9 (c) are plan views of other embodiments showing the method for securing the guides to the rotary blades;

Figs. 10 (a) to 10 (c) are cross sectional views of Figs. 9 (a) to 9 (c); and

Fig. 10 is a plan view of another embodiment of the second traverse means.

PREFERRED EMBODIMENTS

Some embodiment of the present invention will now be described with reference to the accompanying drawings.

Referring to Fig. 1 which is a schematic view seen from the front of a winding apparatus of the present invention, after a yarn Y is drawn by a drawing apparatus (not illustrated), the yarn Y is fed through a snail guide 8, which serves as a fulcrum of traverse motion, and is wound by a winding apparatus 1.

Upon winding operation, while the yarn Y is traversed to and fro (in a direction perpendicular to the sheet) by a traversing apparatus 3, it reaches a contact roller 4 at a point P and wraps around the contact roller 4.

Two bobbins 6 are inserted onto a bobbin holder 5 and are frictionally driven by the contact roller 4. Thus, two yarns Y wrapping around the contact roller 4 are simultaneously wound onto the bobbins 6 to form two yarn packages 7. However, the description below is done with reference to a yarn,

The contact roller 4 is rotatably mounted on a frame 9 projecting from a slide block 2 which is vertically movable along the winding machine 1. The frame 9 further has the traversing apparatus 3 mounted thereon above the contact roller 4, which apparatus performs the traversing operation.

The construction of the traversing apparatus 3 of the present embodiment will now be explained in detail.

As illustrated in Fig. 2, the traversing apparatus 3 comprises a pair of units UL and UR which are horizontally disposed and which are detachably secured to the frame 9 by bolts 10.

As illustrated in Fig. 3, each of the units UL and UR constituting the traversing apparatus 3 comprises two members U1 and U2, which are disposed upwardly and downwardly, respectively.

Fig. 3 is a detailed cross sectional view of one of the traverse units illustrated in Fig. 2.

The upward traverse unit U1 includes rotary blades 23 and 24 for traversing the yarn Y, and the downward traverse unit U2 also includes rotary blades 25 and 26 for traversing the yarn Y.

As illustrated in Fig. 2, the frame 9 has an electric motor 43 disposed at the front end thereof. The rotation of the motor 43 is transmitted to a gear 29 of the unit UL through a gear 44 which is attached to the output spindle of the motor 43. The gear 29 engages with an adjacent gear 32, which in turn transmits the power to the unit UR.

Reference numerals 11a and 12a (see Fig. 3) denote brackets formed at the upper and lower ends of spindles 11 and 12, respectively, which brackets serve to secure the rotary blade 23 of the upward traverse unit U1 and the rotary blade 25 of the downward traverse unit U2 to the spindles 11 and 12, respectively.

The rotary blades 23 and 24 of the upward traverse unit U1, which will be referred to as the first traverse means hereinbelow, are so arranged that they convey the yarn Y from the center of the traverse stroke to the ends of the traverse stroke. Contrary to this, the rotary blades 25 and 26 of the downward traverse unit U2, which will be referred to as the second traverse means hereinbelow, are so arranged that they convey the yarn Y from the ends of the traverse stroke to the center of the traverse stroke.

As it is clearly shown in Fig. 4, the traverse units U1 and U2 are so arranged that planes which are formed by the rotations of the blades 23, 24, 25 and 26 are perpendicular toa plane formed by the traversing motion of the yarn Y or that the former planes are inclined downward (in this embodiment 30°) in a feeding direction of the yarn Y relative to the latter plane formed by the traversing motion of the yarn Y.

A guide 37 (Fig. 2) is secured to the unit U1, and a guide 38 is secured to the unit U2. The shape of guide rail 37a formed on the guide 37 is so selected that the yarn Y is traversed at a substantially constant speed along the guide rail 37a by the rotary blades 23 and 24.

In the meantime, the shape of the guide rail 38a formed on the guide 38 is so selected that when the yarn Y is conveyed by the rotary blades 25 and 26, a speed of the yarn Y conveyed by the rotary blades 25 and 26 is made almost same as that by the rotary blades 23 and 24 at the center of traverse motion and is gradually decreased from a speed between 1.5 and 7 times af that by the rotary blades 23 and 24 to that by the rotary blades 23 and 24 at the ends of traverse motion.

Arrows in Fig. 2 show the rotational directions of the rotary blades.

Due to the above-described construction, the yarn Y is moved by the rotary blade 24 of the first traverse means from the center of traverse stroke toward one of the ends of traverse stroke. Then, the yarn Y moved to the end of traverse stroke is transferred to the rotary blade 26 of the second traverse means and is reversed from the end of traverse stroke toward a center of traverse stroke. Thereafter, traversing of the yarn Y moved toward the center of traverse stroke is taken over by the rotary blade 23 of the first traverse means, and when the yarn Y reaches the other end of traverse stroke, the yarn Y is transferred to the rotary blade 25 of the second traverse means. Thus, the yarn Y is again reversed toward the center of traverse stroke. The traversing operation is repeated in a foregoing manner.

The distance between the rotary blades 23 and 24, and 25 and 26 of the first and second traverse means may be the same.

Referring to Figs. 4, 5 and 6, the yarn transferring steps of the present invention will now be explained in detail.

At time ① in Fig. 4, a yarn Y is moved to the left by the rotary blade 24 of the first traverse means. The yarn Y is moved to the left at an almost constant speed from the center of traverse stroke. When the yarn Y reaches the turning point near the left end of the traverse stroke (condition denoted by ②), the yarn Y comes in contact with the rotary blade 26 which is rotating in the right. However, the rotary blade 24 continues to move the yarn Y to the left. At this time, the moving speed to the right of the rotary blade 26 of the second traverse means is seven times as large as the traversing speed V of the yarn Y near position denoted by ①. The speed of the rotary blade 26 may be in a range between 1.5 to 7 times of the yarn speed V.

The yarn is moved by the rotary blade 26 to a position slightly deviated toward the center of traverse stroke from an imaginary line connecting a point, where the yarn is in contact with the contact roller 4, and the rotary blade 24. Then, the yarn Y engages with the guide rail 37a of the upward unit U1, and the yarn Y is released from the rotary blade 24.

In order to slightly deviate the yarn Y as described above, the traverse stroke S1 of the yarn conveyed by the rotary blade 24 is so selected that following equation is satisfied.

$S1 \geqq S0 + 2L1 \tan \theta$

In this equation, the parameters are as follows: S0 stands for stroke of the yarn Y wrapping around the contact roller 4;

L1 stands for a distance from the rotary blade 24 to the wrapping point on the contact roller; and θ stands for a winding angle of the yarn.

Further, the traverse stroke S2 when the rotary blade 26 engages with the yarn Y is so selected that following equation is satisfied.

$S2 \leqq S0 + 2L2 \tan \theta$

In this equation, the parameter L2 stands for a distance from the rotary blade 26 to the wrapping point on the contact roller 4.

The yarn Y, which has been disengaged from the rotary blade 24, is gradually decreased its speed from an initial speed of 7V to a speed almost equal to V by the rotary blade 26 from a postion denoted by ② to a position beyond the position ②′ where the winding angle θ is reversed, and then, the yarn Y is moved to the right by the rotary blade 26 as illustrated in ③ in Fig. 5.

The situations where the yarn Y reaches the left traverse end will now be explained in detail. As illustrated in Fig. 6 (a), the rotary blade 26 has an auxiliary blade portion 26a which is forked and with which the yarn Y is engaged. Thus, the yarn Y is restricted by the grooved portion 26b of the rotary blade 26 when the yarn Y is released from the rotary blade 24 so that adverse influences caused by moment of inertia and unstableness caused by sudden changes in tension of the yarn Y when the yarn Y is disengaged from the rotary blade 24 are prevented. The rotary blade 25 is similarly shaped. The grooved portions 25b and 26b extend in a lengthwise direction of the rotary blades 25 and 26 and hold the yarn at a region from the end of the traverse stroke illustrated in Fig. 6 (a) to the center of the traverse stroke illustrated in Fig. 6 (b).

Fig. 6 (b) shows the transfer of the yarn Y at time ③ in Fig. 5, and Fig. 6 (c) shows the transfer of the yarn Y at time ④ in Fig. 5.

When the yarn Y is transferred near the center of the traverse stroke as illustrated in ④ in Fig. 5, the yarn Y engages with the rotary blade 23 of the first traverse means, which is disposed upwardly from the rotary blade 26 of the second traverse means by a predetermined distance, and the yarn Y is moved to the right at a speed V.

After the rotary blade 23 reaches near an extended line of an imaginary straight line connecting the wrapping point of the yarn Y on the contact roller 4 and the rotary blade 26, the yarn Y, which has been conveyed by the rotary blade 26 and which is to be conveyed by the rotary blades 25 and 23, engages with the guide rail 38 of the downward traverse unit U2 as illustrated in Fig. 6 (c). Then, the yarn Y is disengaged from the rotary blade 26, and it is moved to the right by the rotary guide 23 of the first traverse means as illustrated in ⑤ in Fig. 5.

Thereafter, the yarn Y reaches the right end of the traverse stroke. When the yarn Y, which has been conveyed by the rotary blade 23, reaches the turning point (conditions denoted by ⑥ in Figs. 4 and 5), it is engaged with the rotary blade 25 which is rotating to the left. At this moment, the rotary blade 23 continues to convey the yarn Y to the right. The yarn Y engages with the guide rail 37a of the upper traverse unit U1 at a position where the yarn Y is slightly deviated by the rotary blade 25 form an imaginary straight line connecting the contacting point on the contacting roller 4 and the rotary blade 23, and the yarn Y is disengaged from the rotary blade 23.

Similar to the foregoing explanation, the traverse stroke S1 is so selected that $S1 \geqq S0 + 2L1 \tan \theta$, and the traverse stroke S2 is so selected that $S2 \leqq S0 + 2L2 \tan \theta$.

The yarn Y disengaged from the rotary blades 23 is gradually decreased its speed from a speed of 7V to a speed of almost V by the rotary blade 25 until the winding angle is reversed in a manner similar to the above-described 2′, and ②′, and it is moved to the left as denoted by ⑦ in Fig. 4.

When the yarn Y is moved near the center of the traverse stroke as denoted by ⑧ in Fig. 4, it engages with the rotary blade 24, which is disposed upwardly from the rotary blade 25 by a predetermined distance, and it is conveyed at a speed V by the rotary blade 24.

After the rotary blade 24 reaches near an extended line of an imaginary straight line connecting the wrapping point of the yarn Y on the contact roller 4 and the rotary blade 25, the yarn Y, which has been conveyed by the rotary blade 25 and which is to be conveyed by the rotary blade 24, engages with the guide rail 38 of the downward traverse unit U2. Then, the yarn Y is disengaged from the rotary blade 25, and it is moved to the left by the rotary blade 24 as illustrated by ① in Fig. 4.

The yarn speeds during the above-described traversing operation are set by combinations in the shapes of the rotary blades 24 and 23 and the guide rail 37a, and the rotary blades 25 and 26 and the guide rail 38a.

The above-described transfer of the yarn is repeated, and a yarn package is formed on the bobbin 6 inserted onto the bobbin holder 5.

The relationships between the yarn conveying speeds by the rotary blades of the present invention and the hardness of the outer periphery of the wound package will now be explained.

It is preferred that the difference in hardness of the outer periphery of the obtained package is small in the entire width of the package in order to minimize the uneveness in the yarn quality and to enhance the strength of the package. In order to meet this end, according to the present invention, the yarn conveying speeds of the rotary blades are specially designed. As a result, the difference in hardness of the outer periphery of the obtained package can be small according to the present invention. The inventive method will now be explained.

Figs. 7 (a) to 7 (f) are diagrams showing the relationships between the traverse strokes and the yarn conveying speeds of the rotary blades, wherein the abscissa, i.e., X-axis, denotes the traverse stroke, and the ordinate, i.e., Y-axis denotes the speed ratio (a broken line) of the first traverse means to the traverse speed at the center of the traverse stroke and the speed ratio (a solid line) of the second traverse means to the traverse speed at the center of the traverse stroke. Reference numeral Ⓐ denotes the position where the winding angle is reversed at the end of the traverse stroke. Further, Figs. 8 (a) to 8 (f) show the hardness of the packages obtained by the speed illustrated in Figs. 8 (a) to 8 (f).

The abscissa, i.e., X-axis, denotes the width of the package, Ⓑ denotes the end of the package, Ⓒ denotes the center of the package, and only left half is illustrated since the package hardness is almost symmetrical for the left and right portions of the package.

The ordinate, i.e., Y-axis, denotes the package hardness which is a mean value of six packages measured by "Yarn Hardness" manufactured by Nakaasa Sokki, in Japan, at every 5 mm from the end of the packages. Since the hardness at position Ⓑ, which is the ends of the packages, cannot be measure, the value at the position 5mm away from the position Ⓑ is substituted therefor.

The data illustrated in Fig. 8 are obtained under the following winding conditions. Polyester drawn yarn of 75 de/36 filaments with a circular cross section is wound at a speed 5,600 m/min at a winding angle of 6.8° under a winding contacting pressure of 16 kg, at a winding tension between 14 and 16 g. The winding machine is of a spindle drive type, wherein six packages are wound on a single bobbin holder.

In Figs. 7 (a) to 7 (c), the traverse speed of the first traverse means is almost constant, and the traverse speed of the second traverse means is increased to a value 2 to 7 times as large as that of the first traverse means at the end of the traverse stroke and is gradually decreased before the point Ⓐ. The package hardness of the obtained packages are correspondingly illustrated in Figs. 8 (a) to 8 (c).

In Figs. 7 (d) and 7 (e), the traverse speed of the second traverse means is decreased beyond that of the first traverse means at the center of the traverse stroke in order to minimize the difference in the package hardness. In Fig. 7 (d), the speed of the second traverse means is decreased by 5 % relative to the constant speed, and in Fig. 7 (e), the speed of the second traverse means is decreased by 8 % relative to the constant speed, the package hardness of the obtained packages are correspondingly illustrated in Figs. 8 (d) and 8 (e).

Fig. 7 (f) show the winding under the traverse speeds of the first and second traverse means are almost constant, and package hardness is illustrated in Fig. 8 (f).

In the explanations above, the decrease of the traverse speed at the center of the traverse stroke is performed by the second traverse means, however, it may be done only by the first traverse means, or by both the first and the second traverse means.

Although in the illustrated embodiment, the distance between the rotary blades 25 and 26 is larger than that of the rotary blades 23 and 24, the distances may be equal.

In the illustrated embodiment, as illustrated in Fig. 2, the rotary blades are integrally formed. However, as illustrated in Figs. 9 (a) and 10 (a), holder 40 and yarn guide 41, which is, for example, made of ceramic, are separately formed and are secured to each other by bolts 42.

Further, as illustrated in Figs. 9 (b) and 10 (b), the holder 40 and the yarn guide 41 may be rivetted 43 or secured by bolts, and the holder 40 may have an engaging shoulder portion 40a which receives centrifugal force.

In addition, as illustrated in Figs. 9 (c) and 10 (c), the holder 40 and the yarn guide 41 are separated and are rivetted 44 or secured by bolts, and an engaging portion is formed in a circular recess so as to receive centrifugal force.

When the guide guide 38 has projections 38b at the ends of the guide rail 38a forming groove 38c as illustrated in Fig. 11, the yarn Y is securely guided into the grooved portion of the rotary blades 25 and 26 and is prevented from being pushed outwardly, i.e., downward direction in Fig. 11, by the rotary blades 25 and 26.

When the distance between the first traverse means and the second traverse means is excessively small, for example a distance between 5 and 10 mm in a conventional machine, the yarn may be rubbed between the rotary blades of both the traverse means, and accordingly, the obtained yarn may be remarkably deteriorated since fluffs may be created, and since uneveness in strength of the yarn may occur. It is preferred that the distance between the first and second traverse means is set between 15 and 70 mm.

Although the above-described embodiments, the traversing apparatus is used to simultaneously wind two packages onto a bobbin holder, the number of the bobbins may be one or more than two.

The winding apparatus may be of an automatic type which has a plurality of bobbin holders.

Further, in the embodiments, the rotary blades 25 and 26 have recess portions 26b, the portion 26b in Fig. 6 may be omitted while the portion 26a is formed.

According to the yarn traversing apparatus of the present invention, a wound yarn package with a good wound shape and without cob-webbing can be obtained at a high speed winding, and uneveness in the yarn quality of the obtained yarn can be prevented.

Claims

1. In a yarn winding apparatus comprising a bobbin holder for inserting a bobbin thereon, a contact roller pressed onto said bobbin and a traversing apparatus for traversing a yarn which is to be wound onto said bobbin to form a yarn package, said yarn traversing apparatus comprising:
a first traverse means, which is disposed downstream by a predetermined distance from a fulcrum for traverse motion, for traversing said yarn from a center toward ends of traverse stroke; and
a second traverse means, which is disposed downstream by a predetermined distance from said first traverse means, for traversing said yarn from said ends of traverse stroke toward said center of traverse stroke;
said first traverse means comprising a rotary blade moving from said center of traverse motion toward said ends of traverse stroke and a guide rail restricting a speed of said yarn conveyed by said rotary blade, so that speed of said yarn conveyed by said first traverse means is made substantially constant;
said second traverse means comprising a rotary blade moving from said ends of traverse stroke toward said center of traverse motion and a guide rail restricting a speed of said yarn conveyed by said rotary blade of said second traverse means, so that a speed of said yarn conveyed by said second traverse means is made almost same as that of said first traverse means at said center of traverse motion and is gradually decreased from a speed between 1.5 and 7 times of that of said first traverse means to that of said first traverse means at said ends of traverse motion.

2. In a yarn winding apparatus comprising a bobbin holder for inserting a bobbin thereon, a contact roller pressed onto said bobbin and a traversing apparatus for traversing a yarn which is to be wound onto said bobbin to form a yarn package, said yarn traversing apparatus comprising:
a first traverse means, which is disposed downstream by a predetermined distance from a fulcrum for traverse motion, for traversing said yarn from a center toward ends of traverse stroke; and
a second traverse means, which is disposed downstream by a predetermined distance from said first traverse means, for traversing said yarn from said ends of traverse stroke toward said center of traverse stroke;
said yarn being moved by said first traverse means from said center of traverse stroke toward one of said ends of traverse stroke, and then said yarn moved to said end of traverse stroke being moved by said second traverse means from said end of traverse stroke toward said center of traverse stroke, thereafter, said yarn moved toward said center of traverse stroke being moved by said second traverse means from said center of traverse stroke toward the other end of traverse stroke, said yarn moved to said end of traverse stroke being transferred to said second traverse means so as to move said yarn from said end of traverse stroke toward a center of traverse stroke and said yarn moved toward said center of traverse stroke being transferred to said first traverse means; and
releasing said yarn from a yarn guide of said first traverse means after moving said yarn by said second traverse means to a position deviated toward said center of traverse stroke from an imaginary line connecting said first traversing means and a point where said yarn is in contact with said contact roller, when said yarn moved to said end of traverse stroke by said first traverse means is engaged with said second traverse means.

3. A yarn traversing apparatus according to claim 1 or 2, which is so arranged that following equations are satisfied. $S1 \geqq S0 + 2L1 \tan \theta$
$S2 \leqq S0 + SL2 \tan \theta$
wherein:
S1 stands for stroke of said first traverse means when it releases said yarn;
S2 stands for stroke of said second traverse means at that time;
S0 stands for stroke of said yarn wrapping around said contact roller;
L1 stands for a distance from said first traverse means to said wrapping point on said contact roller;
L2 stands for a distance from said second traverse means to said wrapping point on said contact roller; and
θ stands for a winding angle of said yarn.

4. A yarn traversing apparatus according to claim 1 or 2, which is so arranged that traverse speed is decreased at said center of traverse stroke in a range not more than 10 % of that of constant speed region.

FIG. 1

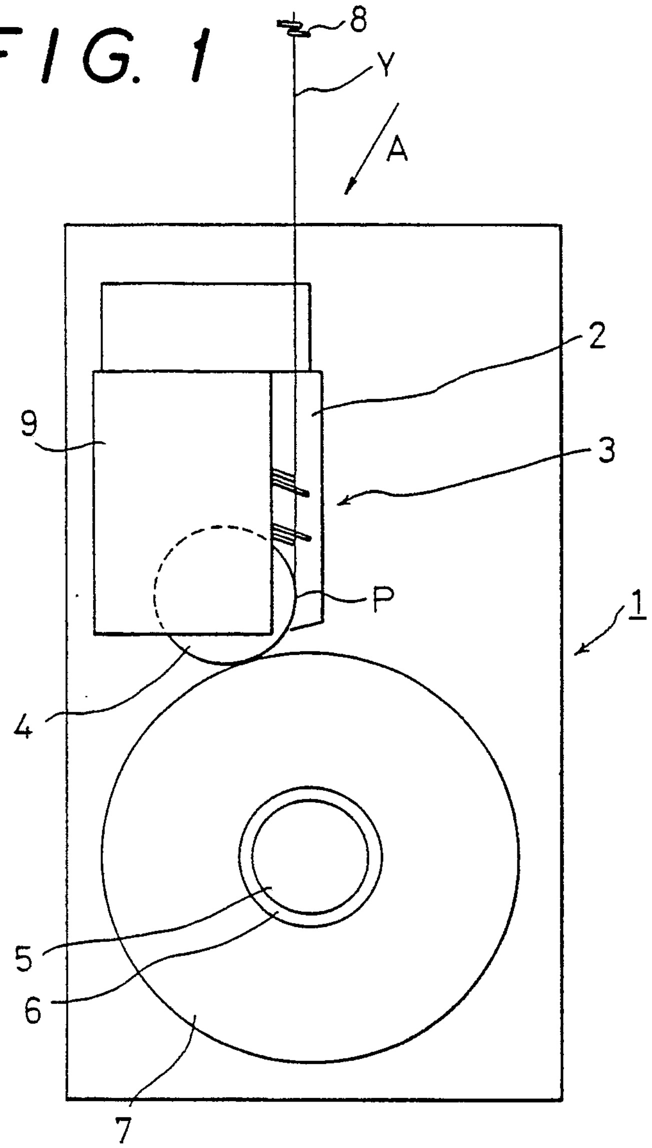


FIG. 11

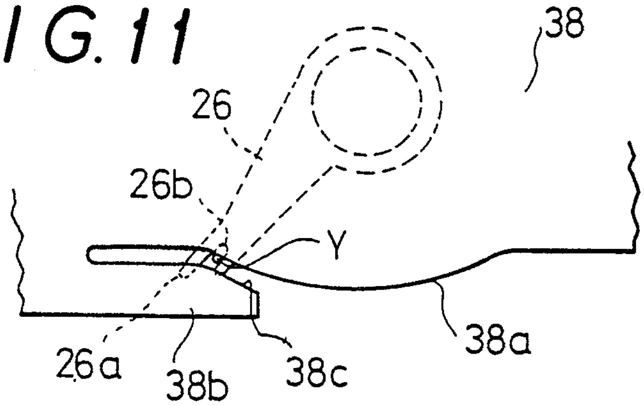
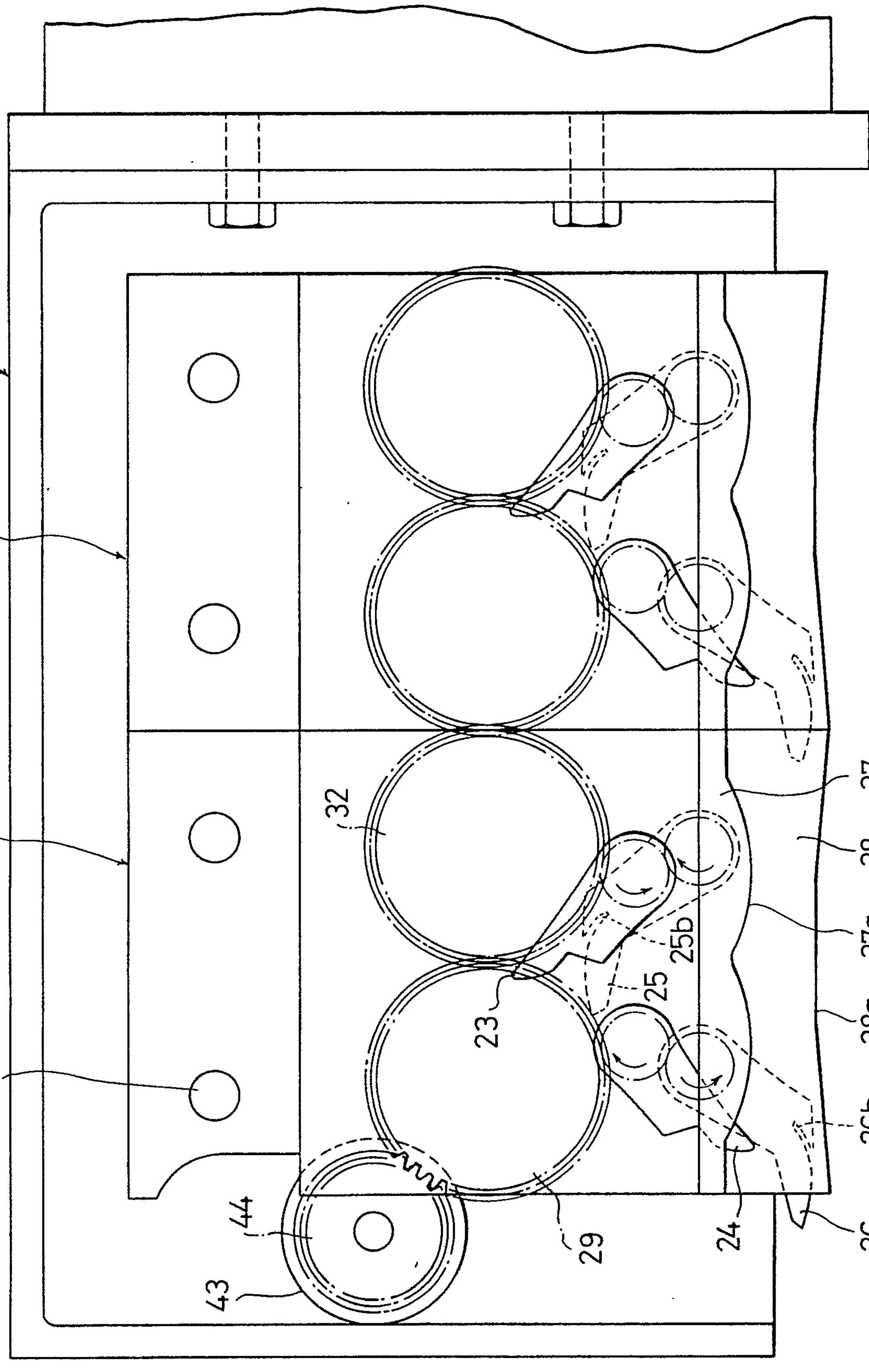


FIG. 2



F I G. 3

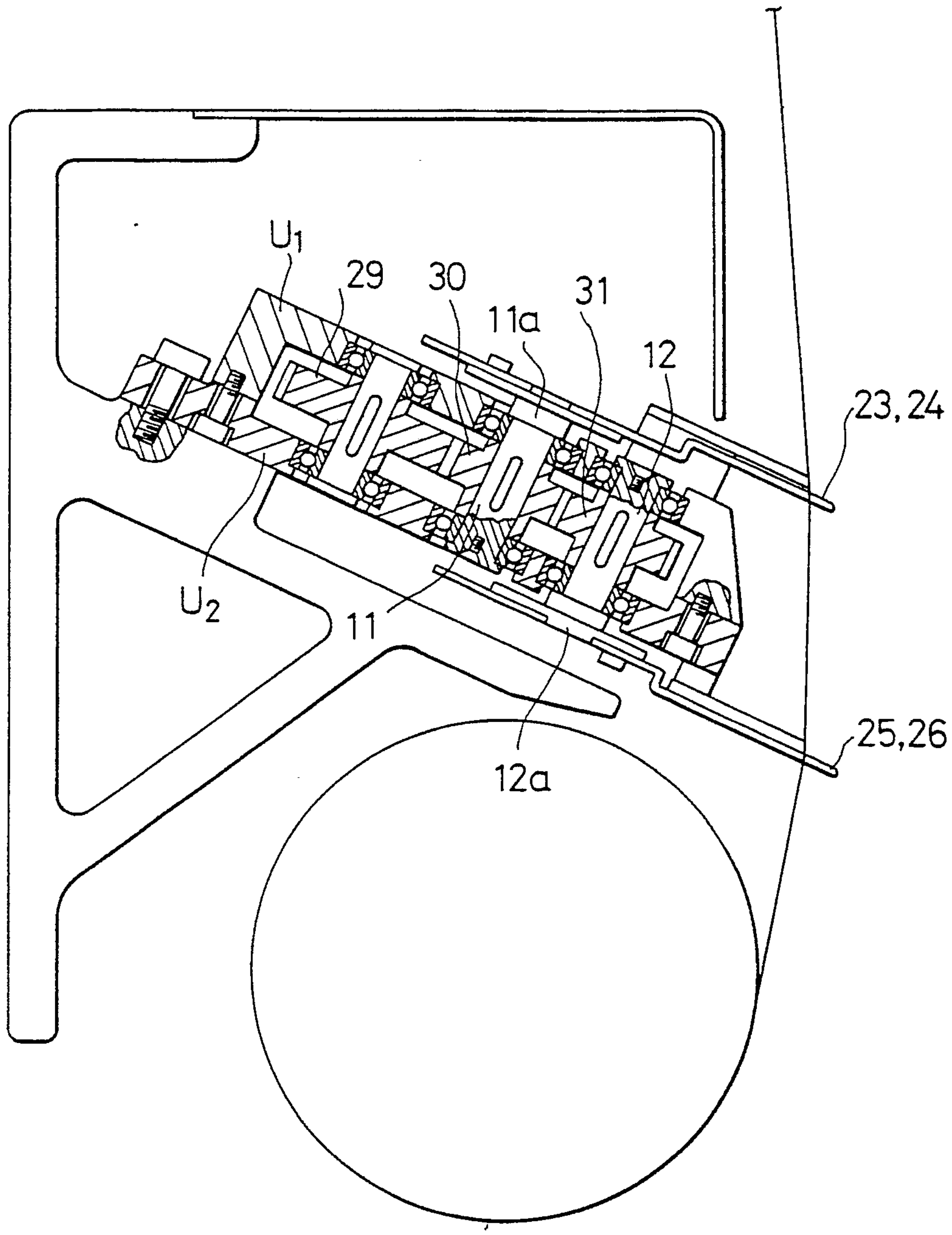


FIG. 4

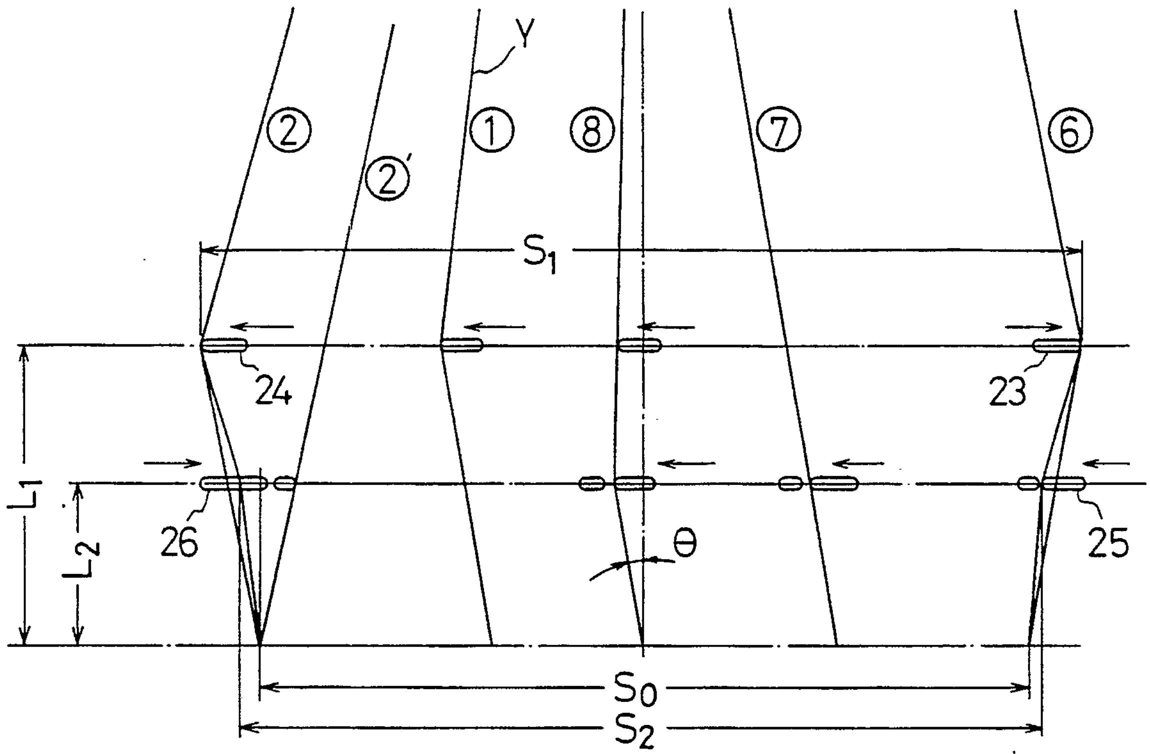


FIG. 5

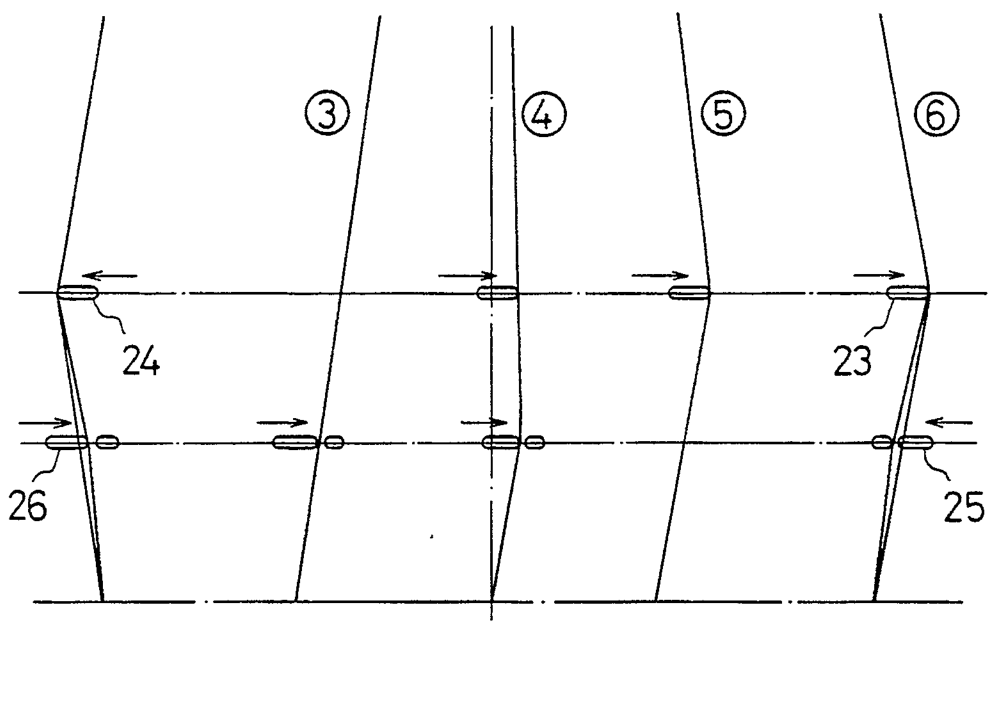


FIG. 6(a)

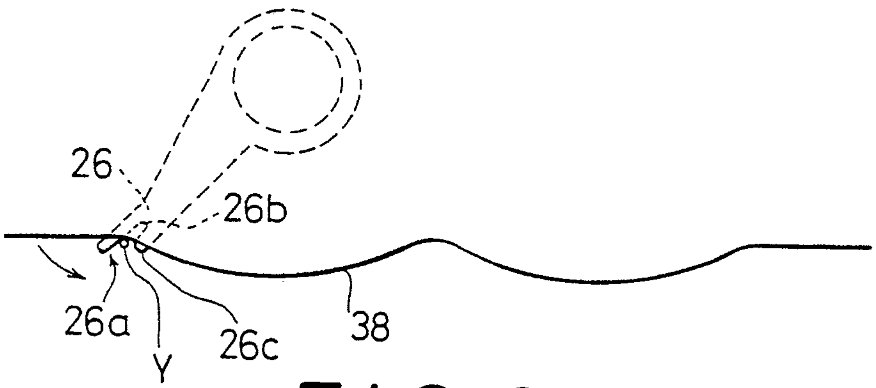


FIG. 6(b)

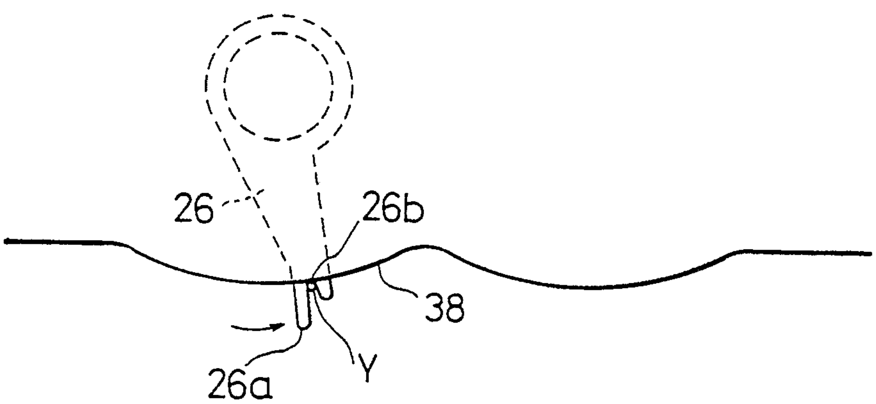


FIG. 6(c)

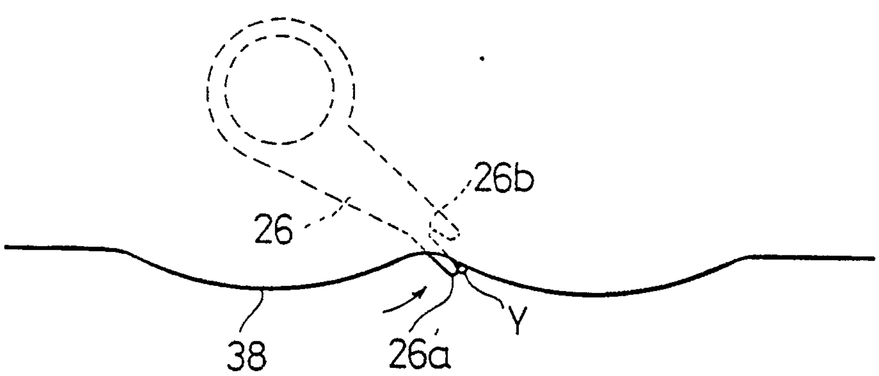


FIG. 7(a)

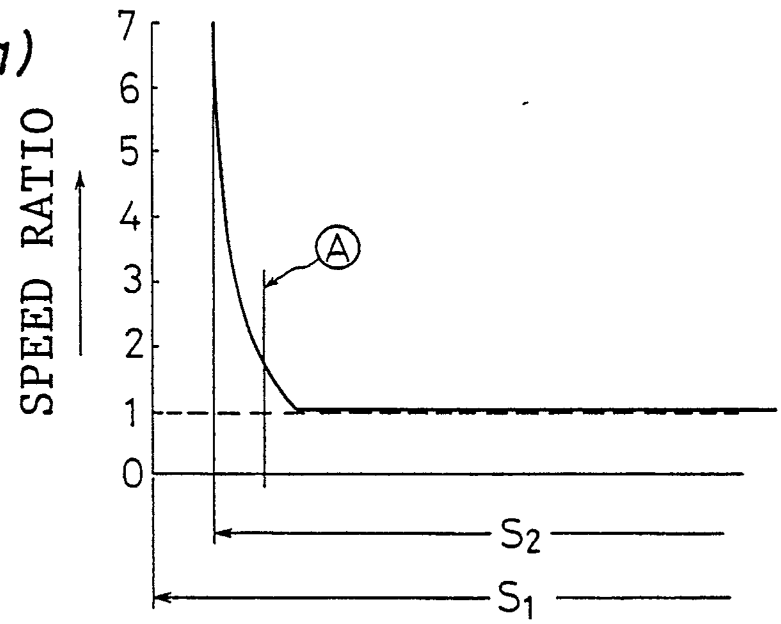


FIG. 7(b)

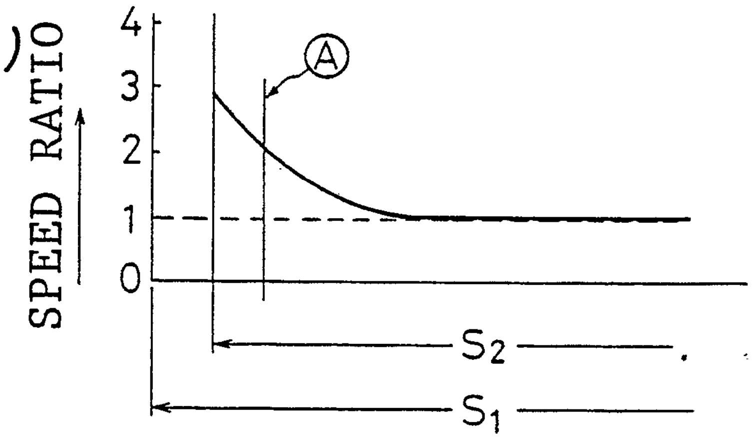


FIG. 7(c)

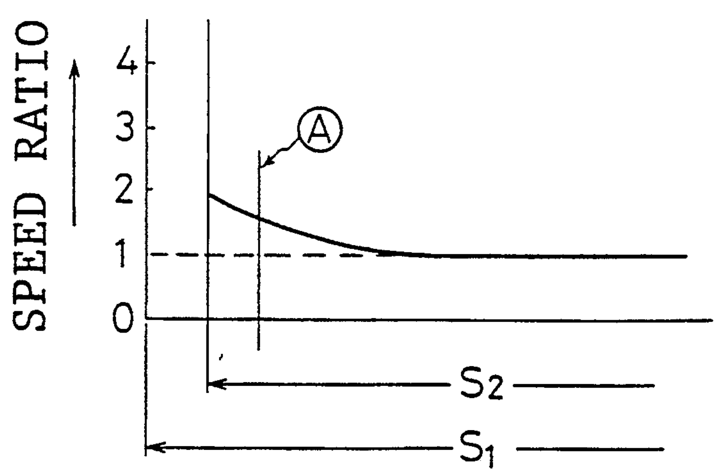


FIG. 7(d)

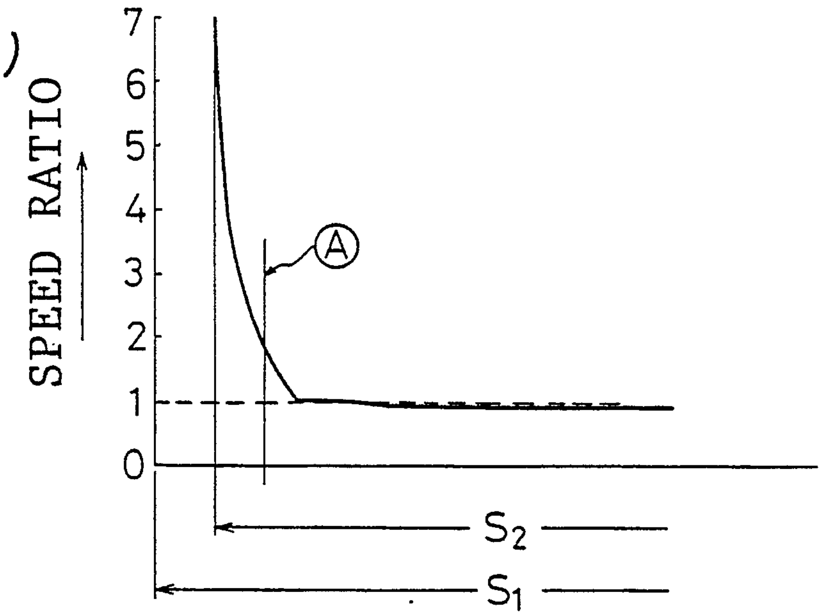


FIG. 7(e)

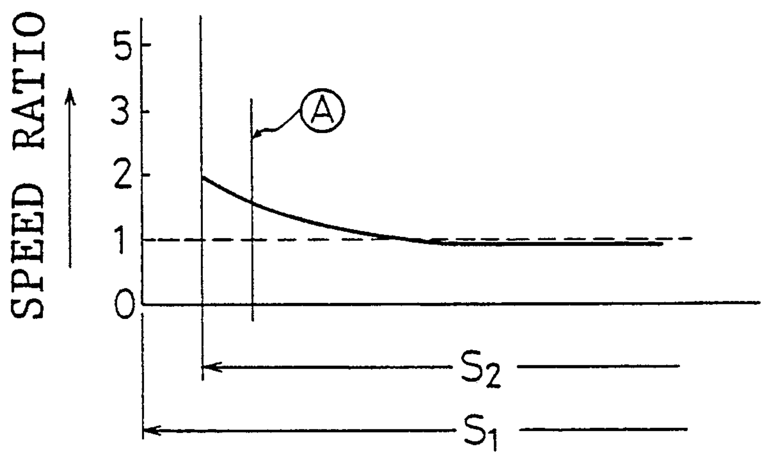


FIG. 7(f)

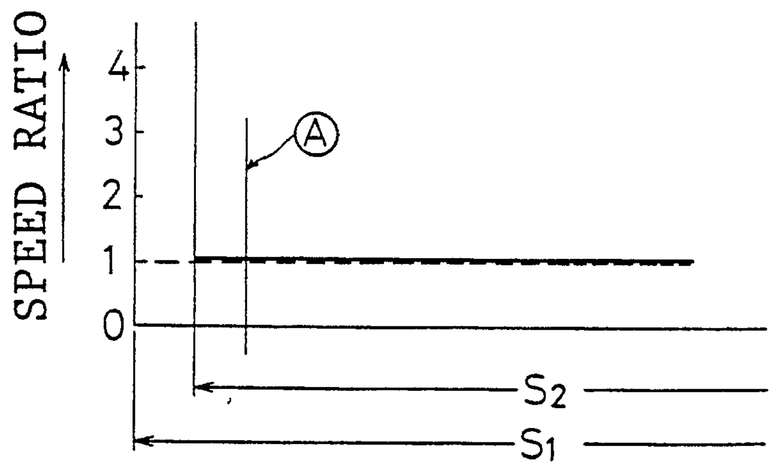


FIG. 8(a)

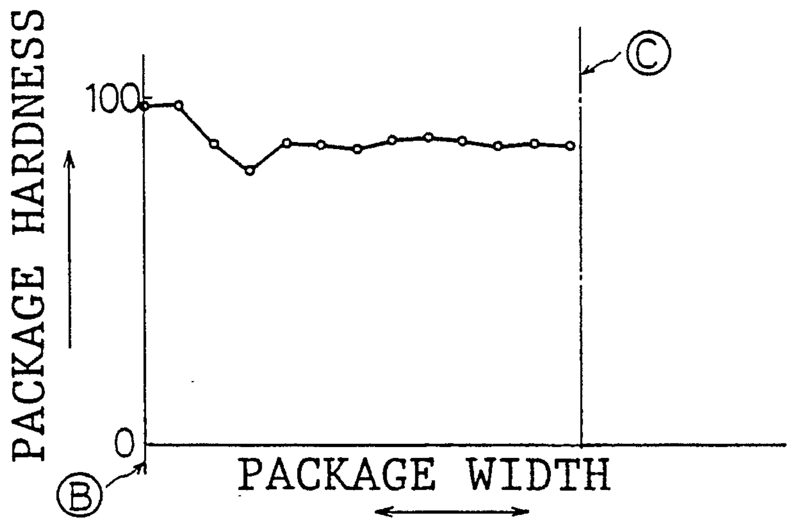


FIG. 8(b)

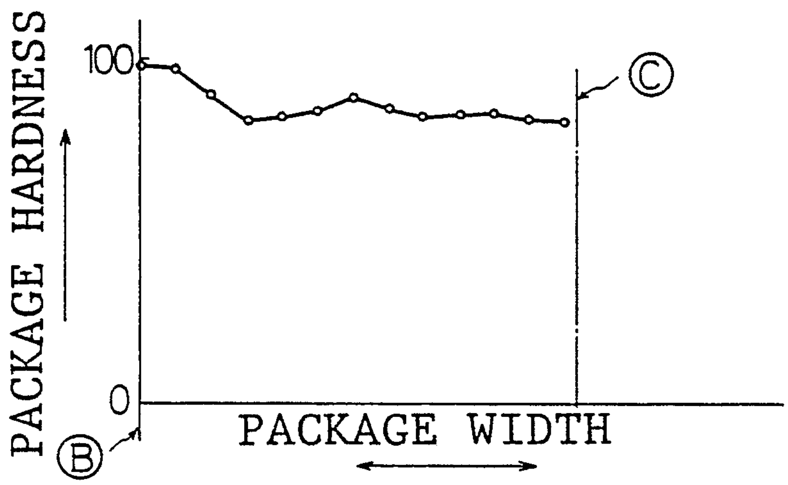


FIG. 8(c)

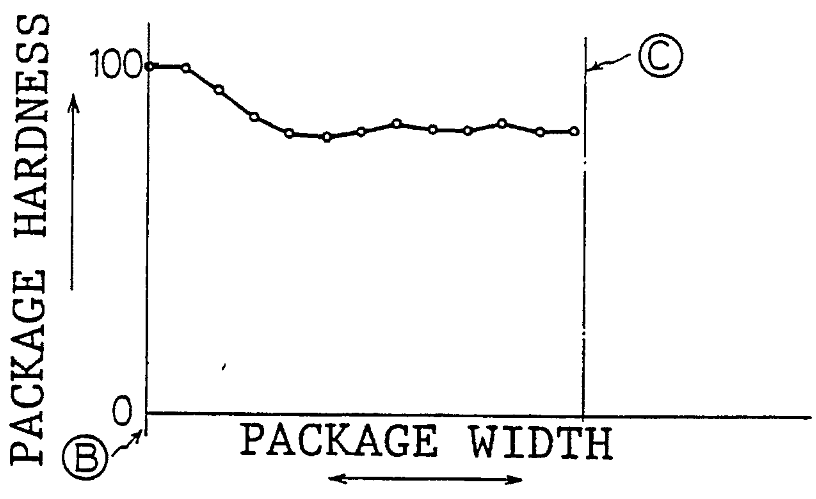


FIG. 8(d)

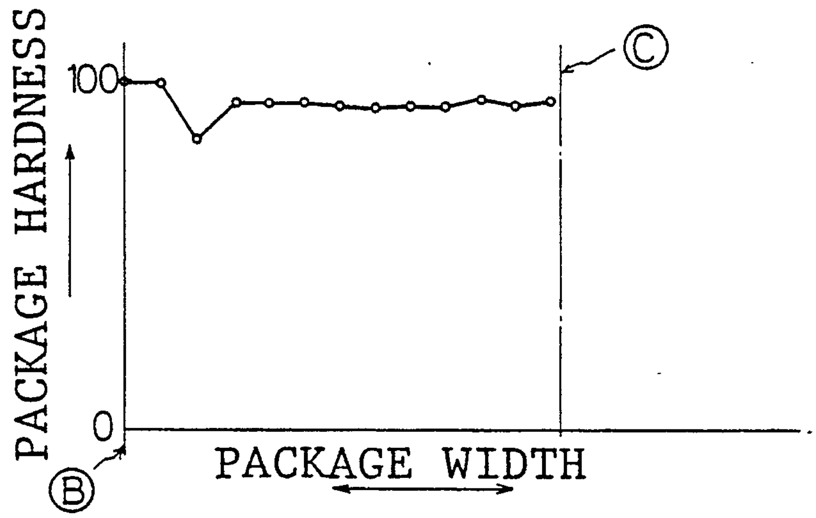


FIG. 8(e)

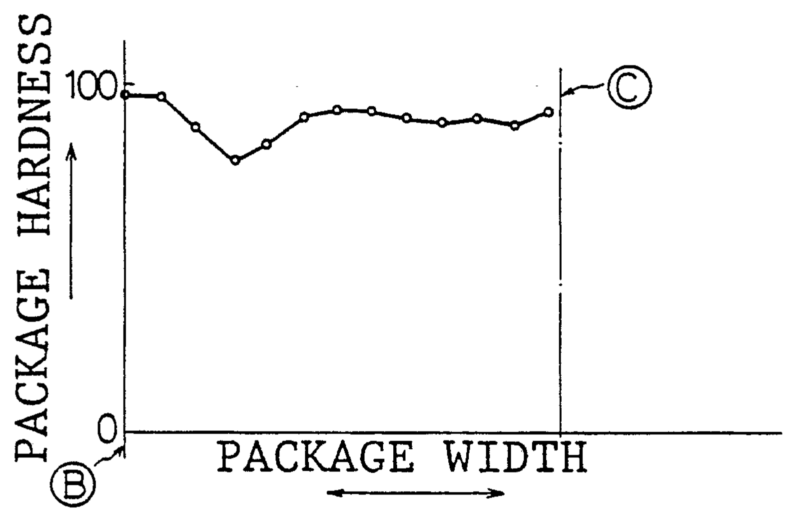


FIG. 8(f)

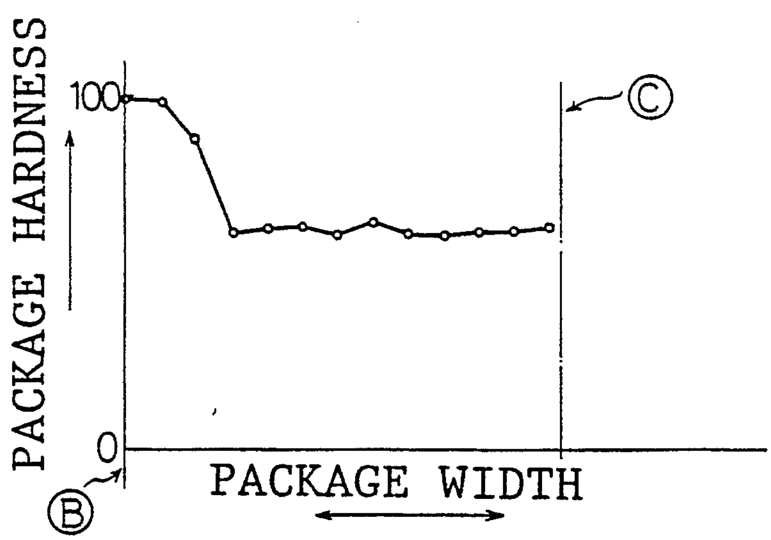


FIG. 9(a)

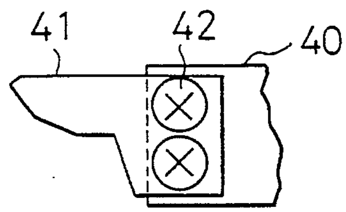


FIG. 9(b)

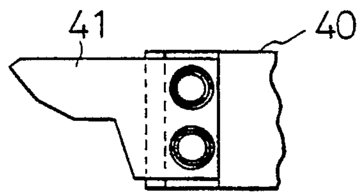


FIG. 9(c)

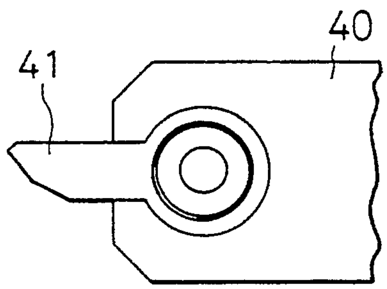


FIG. 10(a)

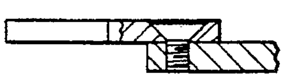


FIG. 10(b)

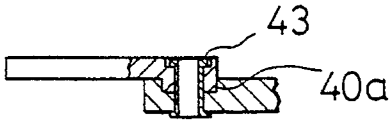


FIG. 10(c)