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(71) Applicant: **FUJI PHOTO FILM CO., LTD.**
210 Nakanuma Minami Ashigara-shi
Kanagawa(JP)

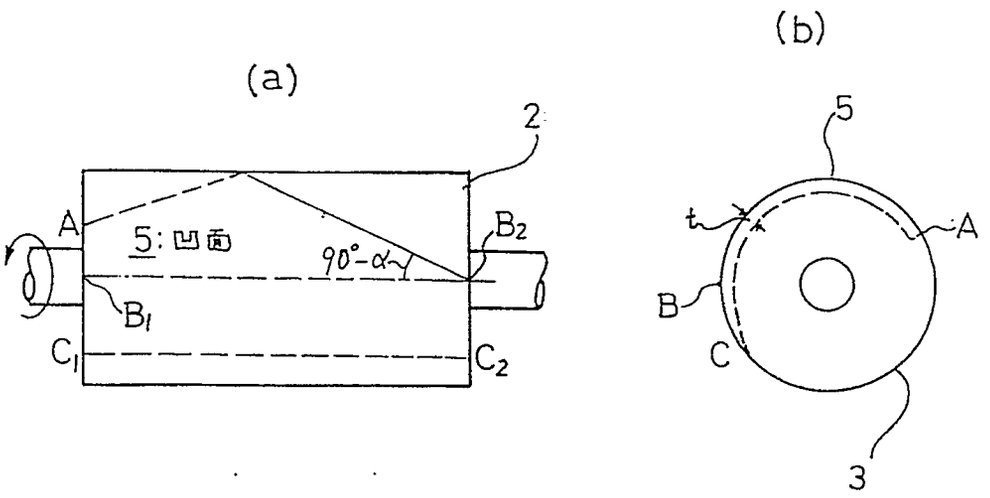
(72) Inventor: **Yoshida, Junichiro, c/o Fuji Photo Film Co., Ltd.**
200, Onakazato
FUjinomiya-shi, Shizuoka(JP)
Inventor: **Ohinata, Akira, c/o Fuji Photo Film Co., Ltd.**
200, Onakazato
FUjinomiya-shi, Shizuoka(JP)

(74) Representative: **Patentanwälte Grünecker, Kinkeldey, Stockmair & Partner**
Maximilianstrasse 58
W-8000 München 22(DE)

(54) Web-winding core.

(57) A web-winding core of the present invention is characterized in that a surface of the winding core on which a web is adapted to be wound has a recessed surface which has a shape analogous to the shape of a leading edge portion of the web and is analogous in thickness to the web.

FIG. 1



EP 0 444 632 A1

BACKGROUND OF THE INVENTION

This invention relates to a web-winding core adapted to be attached to a winding device when applying a coating or a surface treatment to a surface of a long flexible substrate (hereinafter referred to as "web") such as a plastic film and a metal sheet.

Products formed by applying a coating or a surface treatment to a web have been extensively used in the industries. Many of these products use an expensive material such as a photosensitive material. Therefore, it is desired to enhance the yield of the product as much as possible.

One drawback which lowers the yield of such product is that the shape of the leading edge of the web wound on the web-winding core is transferred to those portions of the web disposed in overlapping relation to the leading edge by the web-winding pressure. More specifically, with respect to the product wound on the web-winding core, the web is bonded to the winding core by an adhesive, an electrostatic charge, or other means, and then the web is sequentially wound in overlapping relation to the leading edge of the web having such a shape as an obliquely linear shape, an arcuate shape, a serrated shape and a triangular shape. Therefore, a step corresponding in thickness to the web is formed between the leading edge of the web and the surface of the winding core. Accordingly, in proportion to the web-winding pressure, a shape analogous to the shape of the web leading edge is formed on those portions of the sequentially-wound web disposed at the above step. A coating layer or a surface treatment layer on the surface of the web is plastically deformed at this portion, and in the case of a photosensitive material, this causes a pressure fogging or the like, thus producing defective products, which lowers the yield.

Such defect due to this transfer, though varying depending on the material of the web, the diameter of the winding core, the material of the winding core, the winding conditions, etc., usually continues to develop until several turns to several tens of turns of the winding from the start of the winding.

In order to overcome this difficulty, it has been proposed to increase the diameter of the winding core, to adjust the winding pressure, and to utilize a cushioning effect of urethane rubber or the like by winding on the surface of the winding core so as to suppress the transfer.

However, increasing the diameter of the winding core leads to an increased weight of the winding core, and this is disadvantageous from the viewpoints of transport and storage. The decrease of the winding pressure may possibly cause the wound web to be displaced out of position. The cushioning effect achieved by winding the urethane rubber or the like on the surface of the winding core is effective at an initial stage, but is not suited for a long-term use because of aging deterioration thereof.

When the rubber is used for a long time period, the elastic function of the rubber is lowered, so that the cushioning effect can not be obtained, and besides the rubber is separated into granular form and may possibly be introduced into the product.

SUMMARY OF THE INVENTION

The present invention has been made in view of the above problems, and an object of the invention is to stably prevent the transfer, thereby enhancing the yield of the product. The above object has been achieved by:

(1) a web-winding core CHARACTERIZED in that a surface of the winding core on which a web is adapted to be wound has a recessed surface which has a shape analogous to the shape of a leading edge portion of the web and is analogous in thickness to the web; and

(2) a web-winding core described in (1), in which the depth of said recessed surface is the maximum at its portion of contact with the leading edge portion of the web, and is decreasing progressively in the direction of winding of the web.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1(a) is a plan view of a preferred embodiment of a web winding core of the present invention;

Fig. 1(b) is a side-elevational view thereof;

Fig. 2(a) is a developed view of a leading edge portion of a web to be wound on the core of Fig. 1; and

Fig. 2(b) is a side-elevational view of the web.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With respect to the present invention, the leading edge of the web may have any shape such as conventionally-used shapes, such as an obliquely linear shape, an arcuate shape, a serrated shape and a triangular shape; however, a simple shape such as the obliquely linear shape and the triangular shape is preferred in view of the fact that the recessed surface and the leading edge portion of the web are mated

together.

According to the present invention, it is preferred that the most deep portion of the recessed surface with which the leading edge portion of the web is contacted is in the range of between a value 5% smaller than the web thickness and a value 5% larger than the web thickness.

In the present invention, the surface of the winding core has the recessed surface which has the shape analogous to the shape of the leading edge portion of the web and is analogous in thickness to the web. This recessed surface is formed by cutting the surface of the winding core or the surface of a resin layer formed on the surface of the winding core, using a numerically-controlled milling machine. Metal (preferably, light metal such as aluminum), FRP or the like are usually used as a material for the winding core.

The depth of the above recessed surface is the maximum at its portion of contact with the leading edge portion of the web, and is decreasing progressively in the direction of winding of the web. Thus, it is preferred that the depth of the recessed surface should be decreasing progressively in the direction of winding of the web, though the transfer, in some cases, may be eliminated merely by putting the web leading edge portion in the recessed surface of the winding web. Preferably, the progressively-decreasing region of the winding core should be not less than 5% of the peripheral length of the winding core.

In further detail, examples of the web used in the present invention include a plastics film, resin-coated paper, an aluminum web, and synthetic paper. Examples of the material of the plastics film include polyolefin such as polyethylene and polypropylene, a vinyl polymer such as polyvinyl acetate, polyvinyl chloride and polystyrene, a polyamide such as 6,6-nylon and 6-nylon, a polyester such as polyethylene terephthalate and polyethylene-2,6-naphthalate, polycarbonate, and cellulose acetate such as cellulose triacetate and cellulose diacetate. A representative example of the resin used for the resin-coated paper is polyolefin such as polyethylene, but the resin is not always limited to such resin. A preferred embodiment of the present invention will now be described with reference to the drawings. In Fig. 1, a surface 3 of a winding core 2 on which a web is adapted to be wound has a recessed surface which has a shape analogous to the leading edge configuration 4 (extending between A to B2) of the web 1 and has a thickness analogous to the thickness tw of the web. The depth of the recessed surface of this shape is the maximum $t \fallingdotseq (1 \pm 0.05)tw$ at its portion of contact with the triangular leading edge portion (A-B1-B2) of the web, and is decreasing progressively in the direction of winding of the web, from B toward C, so that the recession disappears at the point C. Preferably, the length between B and C should be not less than 5% of the circumference of the web-winding core. With this arrangement, no step is formed not only at the leading edge of the web wound on the winding core, but also at any other portion of the wound web. Therefore, a transfer will not occur.

One embodiment of the present invention will now be described in detail.

A 20 μm-thick coating of a photographic emulsion was applied to a laminate paper sheet with a thickness of 230 μm to prepare a web. A web had a leading edge whose shape was obliquely linear at an angle of 60°, as shown in Fig. 2. A nylon resin was flame-sprayed onto a surface of a cylinder of stainless steel (SUS304) with a diameter of 300 mm to form a resin layer with a thickness of about 5mm thereon, thereby preparing a web-winding core. Using a numerically-controlled milling machine, a recessed surface, which had a shape analogous to the shape of the leading edge portion of the web and was analogous in thickness to the web, was formed by cutting, the deep portion of the recessed surface being 240 μm. The web was wound on each of the winding core of the present invention and a conventional cylindrical winding core, while coating a photosensitive material to the web, and the two webs wound respectively on the two winding cores were compared with each other with respect to the condition of transfer at the web leading edge portion. Results are shown in Table 1.

Table-1

Number of turns of winding	Invention Resin-flame sprayed winding core with recessed surface	Comparative example Resin-flame sprayed winding core of cylindrical shape
1st turn	Δ	X
5th turn	O	X
10th turn	O	X
20th turn	O	O

The circumference of the winding and the presence of the transfer were checked by an organoleptic test.

O no transfer occurred
Δ: slight transfer occurred
X: transfer occurred.

As shown in Table 1, by the use of the web winding core of the present invention, the size of the winding core is kept to the same level as the conventional core, and there is no problem with the winding tension, and a deterioration of the performance due to aging is not encountered, and the transfer of the web leading edge shape is prevented, thus greatly enhancing the quality and yield of the product.

Claims

1. A web-winding core CHARACTERIZED in that a surface of the winding core on which a web is adapted to be wound has a recessed surface which has a shape analogous to the shape of a leading edge portion of the web and is analogous in thickness to the web.

2. A web-winding core according to claim 1, wherein a depth of said recessed surface is a maximum at its portion of contact with the leading edge portion of the web, and is decreasing progressively in the direction of winding of the web.

3. A web-winding core according to claim 2, wherein a maximum depth of said recessed surface is in the range of between a value 5% smaller than the web thickness and a value 5% larger than the web thickness.

4. A web-winding core according to claim 2, wherein a progressively-decreasing region of the web-winding core is not less than 5% of a peripheral length of the web-winding core.

FIG. 1

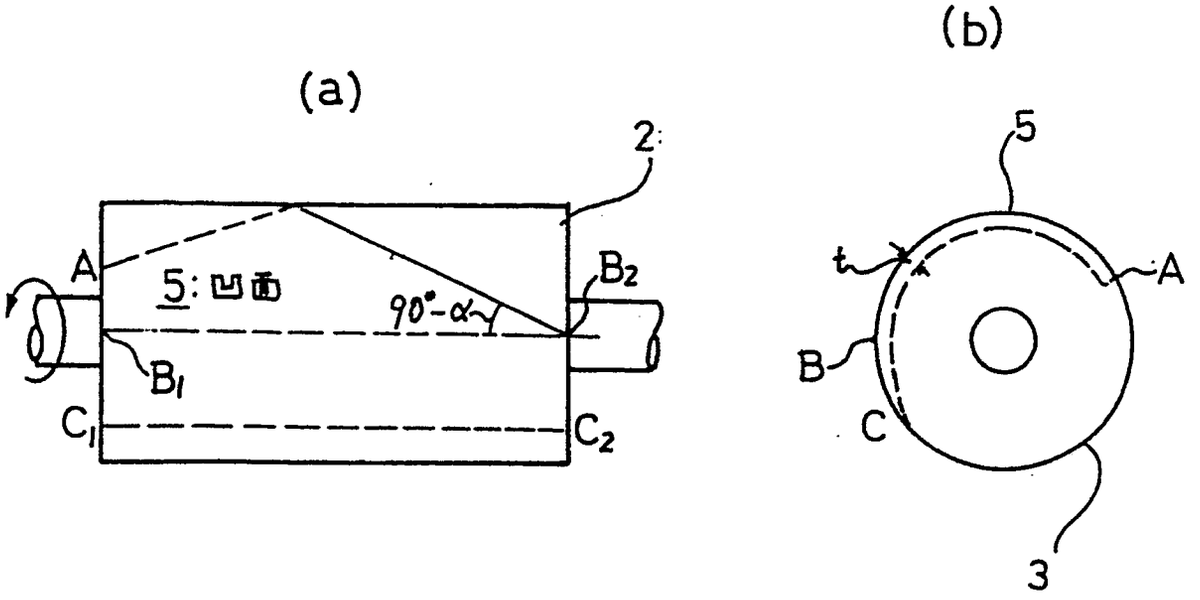
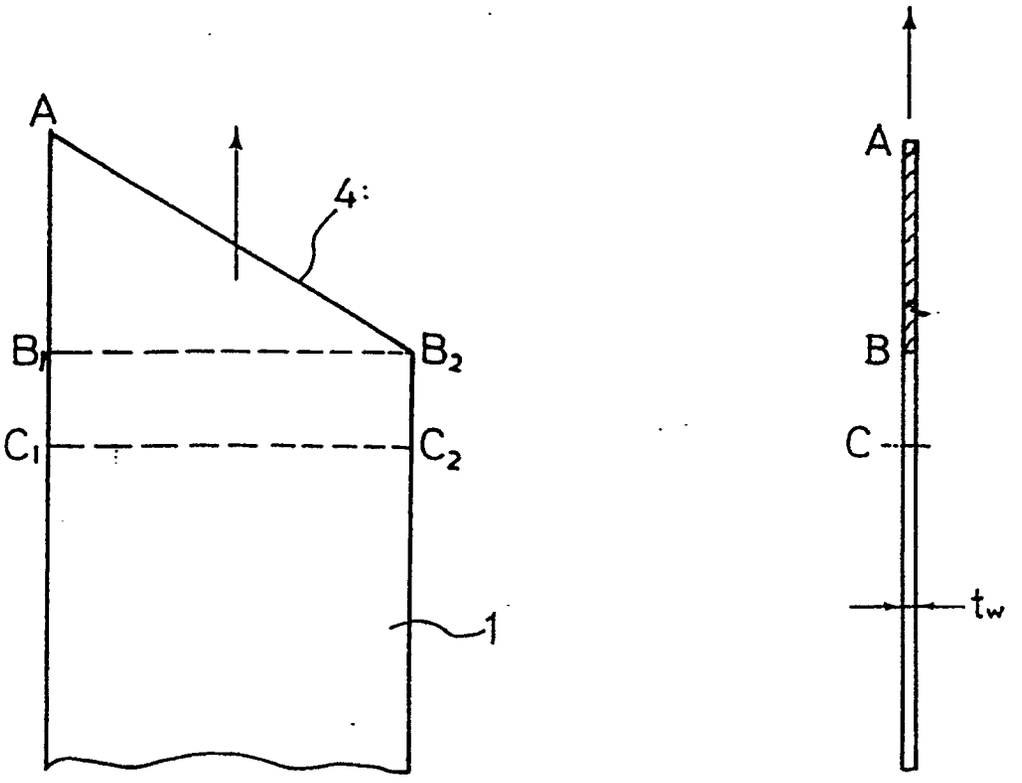


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number

EP 91 10 2924

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.5)
X	FR-A-1 453 686 (ETS. BEILLARD) * figures; page 1, column 1, lines 1-14; page 1, column 2, line 26 - page 2, column 1, line 23; page 2, column 2, lines 1-12 *	1-4	B 65 H 75/28
A	US-A-4 697 757 (T. NAKAYA et al.) * column 1, line 8-66; claim 1 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
B 65 H

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
Berlin	21 May 91	FUCHS H.X.J.

CATEGORY OF CITED DOCUMENTS

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