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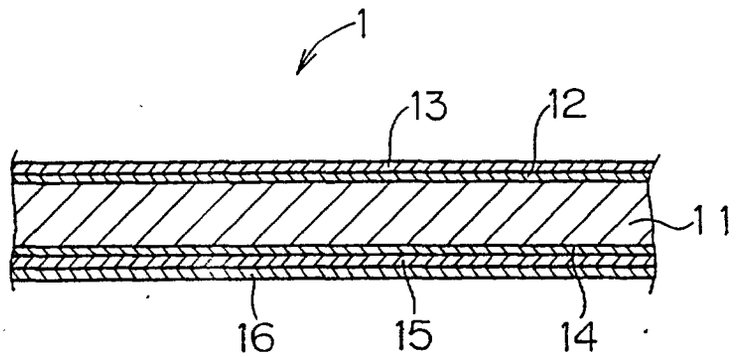
(54) HEAT-SENSITIVE ADHESIVE LABEL, METHOD OF ATTACHING THE LABEL, AND DRY CELL ATTACHED WITH THE LABEL

(57) A heat-sensitive adhesive label and a method of attaching the label capable of maintaining a sufficient adhesive force even when a heat-adhesive resin layer is heated at low temperatures.

The heat-sensitive adhesive label comprises a label base formed of a polyester film with heat shrinkability, a primer layer and a print layer laminated successively over one surface of this label base, and a metal vapor deposition layer, an anchor coat layer and a heat-adhesive resin layer, laminated successively over the other surface of the label base.

During the label attaching process, the heat-adhesive resin layer is subjected to corona discharge and heated to activate the layer, whereby the heat-sensitive adhesive label is attached to a dry cell body, the object for label attaching.

Fig 1



EP 1 124 214 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a heat-sensitive adhesive label to be attached to an article and a method of attaching the label and, more particularly, to a heat-sensitive adhesive label having an excellent adhesion and a method of attaching the label.

BACKGROUND ART

[0002] As a jacket label for a dry cell, for example, a heat-sensitive adhesive label such as disclosed in Japanese Unexamined Patent Publication No. 8-306346 (1996) has been used in which a heat-adhesive resin layer is provided on one surface of a label base of a synthetic resin film.

[0003] Since such a heat-sensitive adhesive label does not have an adhesive property unless it is heated, there is no need to provide an expensive release sheet which is usually used for a pressure sensitive adhesive label (tack label) and, hence, to remove the release sheet from the pressure sensitive adhesive label when the pressure sensitive adhesive label is to be attached. Therefore, the heat-sensitive adhesive label is more advantageous than the pressure sensitive adhesive label in terms of material costs and convenience in the attaching operation.

[0004] Where the dry cell is an article to be labeled, the heat-shrinkable heat-sensitive adhesive label is typically attached to a dry cell body having a metal surface in the following manner: the heat-sensitive adhesive label with the heat-adhesive resin layer thereof being activated by heating is wrapped around the dry cell body with opposite side edge portions thereof projecting out of opposite ends of the dry cell body; the heat-sensitive adhesive label is attached to the dry cell body with opposite end portions thereof being overlapped with each other; and the label is heated again at a high temperature to be heat-shrunk by itself whereby the opposite side edge portions thereof projecting out of the opposite ends of the dry cell body are tightly bonded to opposite end faces of the dry cell body. Therefore, the heat-adhesive resin layer of the label should exhibit sufficient adhesion not only to the metal surface of the dry cell body but also to the label itself at the overlapped portions thereof.

[0005] Particularly, if the label has weak adhesion at the overlapped portions, the upper one of the overlapped portions of the label is liable to be separated during the heat-shrinking of the label or during the use of the dry cell. Therefore, the activated heat-adhesive resin layer should exhibit adhesion sufficient to firmly bond the opposite end portions of the label to each other.

[0006] However, it is impossible to impart sufficient adhesion to the heat-adhesive resin layer of the conventional heat-sensitive adhesive label only by heating the heat-adhesive resin layer at a lower temperature. If the heat-adhesive resin layer is heated at a higher temperature, on the contrary, a print layer provided on a surface of the label base is damaged, resulting in a bad appearance. Where the label base is formed of a heat-shrinkable synthetic resin film as described above, there is a problem that the label base is shrunk to be distorted or wrinkled during the activation of the heat-adhesive resin layer.

[0007] If the heat-adhesive resin layer is heated at a higher temperature for the activation thereof, an energy to be supplied to heating means such as a heater is increased, resulting in a problem of an increase in the running cost of a labeling apparatus.

[0008] It is therefore an object of the present invention to provide a heat-sensitive adhesive label which is imparted with sufficient adhesion even when a heat-adhesive resin layer thereof is heated at a lower temperature, and to provide a method of attaching the label.

DISCLOSURE OF THE INVENTION

[0009] To achieve the aforesaid object, the present invention provides a heat-sensitive adhesive label having a heat-adhesive resin layer provided on a label base thereof, wherein the heat-adhesive resin layer has been subjected to a corona discharge process.

[0010] In the heat-sensitive adhesive label having the aforesaid construction, the heat-adhesive resin layer provided on one surface of the label base has been subjected to the corona discharge process, so that the heat-adhesive resin layer is imparted with sufficient adhesion even when the label is heated at a lower temperature for activation of the heat-adhesive resin layer. Therefore, the label exhibits improved adhesion not only to a metal surface but also to the label itself (to a surface of a UV-cured ink layer, a polyester film or the like), and the running cost of a labeling apparatus can be reduced.

[0011] Where the heat-adhesive resin layer is formed of an ethylene-acrylic acid copolymer, an ethylene-methacrylic acid copolymer, an ethylene-acrylate copolymer or an ethylene methacrylate copolymer, the adhesion of the heat-adhesive resin layer after the heating at a lower temperature can be enhanced.

[0012] The heat-adhesive resin layer can be activated at a lower temperature by subjecting the heat-adhesive resin layer to the corona discharge process as described above. Where the label base is formed of a heat-shrinkable synthetic resin film, therefore, a difference between the temperature for the heat shrinking of the label and the temperature for the activation of the heat-adhesive resin layer can be increased, so that the distortion of the label due to the shrinkage of the label can be suppressed during the activation of the heat-adhesive resin layer.

[0013] Where the heat-sensitive adhesive label is to be attached to an article to be labeled, the heat-adhesive resin layer is subjected to the corona discharge

process and then activated by heating the heat-adhesive resin layer before the heat-sensitive adhesive label is attached to the article. Even if a sequence of heat-sensitive adhesive labels is stored in a roll form, for example, there is no possibility that the labels kept in surface contact with one another suffer from blocking, providing an effect of easy handling of the heat-sensitive adhesive labels.

[0014] Where the heat-sensitive adhesive label is to be attached to the outer circumference of a columnar or tubular article to be labeled, it is preferred that the heat-sensitive adhesive label having the activated heat-adhesive resin layer is first wrapped entirely around the article and then attached to the article with opposite end portions thereof being overlapped with each other.

[0015] Where the article to be labeled is a dry cell body having a metal surface, the heat-sensitive adhesive label is desirably constructed such that the label base thereof is formed of a heat-shrinkable synthetic resin film and the heat-adhesive resin layer thereof is formed of an ethylene-acrylic acid copolymer, an ethylene-methacrylic acid copolymer, an ethylene-acrylate copolymer or an ethylene methacrylate copolymer, and the label is desirably attached to the dry cell body in the following manner.

[0016] First, the heat-adhesive resin layer is subjected to the corona discharge process as described above, and then the heat-sensitive adhesive label with the heat-adhesive resin layer thereof activated by heating is wrapped around the dry cell body with opposite side edge portions thereof projecting out of opposite ends of the dry cell body, and attached to the dry cell body with opposite end portions thereof being overlapped with each other. Then, the heat-sensitive adhesive label attached to the dry cell body is heated again to heat-shrink the label base whereby the opposite side edge portions thereof projecting out of the opposite ends of the dry cell body are tightly bonded to opposite end faces of the dry cell body. Thus, the heat-sensitive adhesive label can assuredly be attached to the dry cell body.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Fig. 1 is a sectional view illustrating a heat-sensitive adhesive label according to a preferred embodiment of the present invention;

Fig. 2 is a sectional view illustrating a heat-sensitive adhesive label according to another preferred embodiment of the present invention; and

Fig. 3 is a schematic diagram illustrating an apparatus for attaching the heat-sensitive adhesive label of Fig. 1.

BEST MODE FOR CARRYING OUT THE INVENTION

[0018] The present invention will hereinafter be described in detail with reference to the accompanying drawings.

[0019] As shown in Fig. 1, a heat-sensitive adhesive label 1 is a jacket label for a dry cell, and comprises a label base 11 formed of a heat-shrinkable polyester film (e.g., a polyethylene terephthalate film) , a primer layer 12 and a print layer 13 provided successively on one surface of the label base 11, and a metal vapor deposition layer 14, an anchor coat layer 15 and a heat-adhesive resin layer 16 provided successively on the other surface of the label base 11.

[0020] The label base 11 has a thickness of 30 im to 60 im, and heat shrinkage ratios of not higher than 1% at 70 C and not lower than 20% at 130 C. For the jacket label for the dry cell, no particular problem will occur as long as the label base 11 has a thickness of 20 im to 100 im, a shrinkage ratio of not lower than 20% as measured circumferentially of the dry cell, and a heat shrinkage ratio of not higher than 3% at 70°C.

[0021] The label base 11 is desirably formed of a polyester film (polyethylene terephthalate film), but may be formed of a polyvinyl chloride film or a polyolefin film.

[0022] The print layer 13 is a layer formed by printing various descriptions and designs with a UV-curable ink which is superior in heat resistance to an ordinary ink of solvent drying type, and a print surface thereof is coated with a UV-curable varnish for protection and lustering of the print layer 13.

[0023] The UV-curable ink is a mixture which contains oligomers of epoxy acrylate, urethane acrylate, polyester acrylate and the like, and a monomer of a polyester or the like blended with a UV polymerization initiator, a colorant such as a pigment, a dispersant and other additives. Specific examples of the UV-curable ink include BESTCURE of Tohka Colorant Chemical Co., Ltd., UVACE of Kuboi Ink Co. Ltd., and CP-UV of Matsui Chemical Co., Ltd.

[0024] The primer layer 12 is provided to improve the adhesion of the print layer 13 to the label base 11, and the provision thereof is not necessarily required.

[0025] The metal vapor deposition layer 14 is formed by vacuum-metallizing the other surface of the label base 11 with aluminum, and has a thickness of 200 to 800 Å. The material for the metal vapor deposition layer 14 is not limited to aluminum, but the metal vapor deposition layer 14 may be formed by vacuum-metallization with nickel or tin, for example.

[0026] The heat-adhesive resin layer 16 is formed by coating the anchor coat layer 15 formed on the other surface of the label base 11 with an ethylene acrylic acid copolymer or an ethylene methacrylic acid copolymer by melt extrusion, and has a thickness of about 5 im to about 30 im. The heat-adhesive resin layer 16 is subjected to the corona discharge process for improvement of the adhesive property thereof. The heat-adhesive resin layer 16 thus formed has an excellent adhesion to both a metal and the print layer 13 and, hence, has a property which is advantageous for use as a heat-adhe-

sive resin layer of a jacket label for a dry cell.

[0027] Preferably used as the material for the heat-adhesive resin layer 16 is an ethylene-based copolymer which is imparted with an adhesive property significantly improved by the corona discharge process, and suitable examples thereof other than the aforesaid ethylene-acrylic acid copolymer and ethylene-methacrylic acid copolymer include ethylene-acrylate copolymers such as an ethylene-ethyl acrylate copolymer and an ethylene-2-ethylhexyl acrylate copolymer, and ethylene-methacrylate copolymers such as an ethylene-ethyl methacrylate copolymer. An ionomer resin and an ethylene-vinyl acetate copolymer can also be used. The heat-adhesive resin layer 16 may be formed of a resin mixture containing any of these resins, and a tackifier, a stabilizer or a modifier may be added thereto as required.

[0028] For formation of the heat-adhesive resin layer 16, the aforesaid melt extrusion coating is desirably employed to efficiently form the heat-adhesive resin layer 16 in a relatively great and uniform thickness, but a solution coating of the aforesaid resin material may be employed.

[0029] The anchor coat layer 15 is provided to improve the adhesion of the heat-adhesive resin layer 16 to the metal vapor deposition layer 14, and the provision thereof is not necessarily required.

[0030] Since the heat-sensitive adhesive label 1 having the aforesaid construction has the heat-adhesive resin layer 16 subjected to the corona discharge process, the label has an adhesion strength comparable to the conventional heat-sensitive adhesive label even if the heat-adhesive resin layer 16 is heated at a lower temperature for the activation thereof. By heating the heat-sensitive adhesive label 1 at a high temperature as in the case of the conventional label having a heat-adhesive resin layer not subjected to the corona discharge process, an adhesive strength higher than the conventional label can be imparted to the heat-sensitive adhesive label 1.

[0031] Since the difference between the temperature for the heat shrinking of the label base 11 and the temperature for the activation of the heat-adhesive resin layer 16 can be increased, the distortion of the label due to the shrinkage of the label base 11 during the activation of the heat-adhesive resin layer 16 can be suppressed.

[0032] With reference to Fig. 3 illustrating a labeling apparatus 30, an explanation will be given to a method of attaching the aforesaid heat-sensitive adhesive label 1 to a dry cell body having a metal surface such as of nickel or iron.

[0033] As shown, the labeling apparatus 30 comprises a label formation section A, a label activation process section B, a label attaching process section C and a heat shrinkage process section D. A process sequence from the formation of the heat-sensitive adhesive label 1 to the attachment of the label to the dry cell body X is continuously performed by the labeling apparatus 30.

[0034] In the label formation section A, a label sheet 1a for label formation which has substantially the same construction as the heat-sensitive adhesive label 1 but with the heat-adhesive resin layer 16 thereof not subjected to the corona discharge process is continuously fed out of a sheet roll 31 which is formed by rolling the label sheet 1a, and then the surface of the heat-adhesive resin layer 16 is subjected to the corona discharge process by a corona discharging device 32. Thereafter, the label sheet 1a is cut into a predetermined length by a cutting edge 33a of a cutting roller 33, whereby the heat-sensitive adhesive label 1 is formed. The label sheet 1a has a width which is slightly greater than the length of the dry cell body X to be labeled.

[0035] As described above, the label sheet 1a with the heat-adhesive resin layer 16 not subjected to the corona discharge process is rolled into the sheet roll 31. Therefore, the heat-adhesive resin layer 16 of the label sheet 1a does not have an adhesive property at this time, so that portions of the label sheet 1a kept in surface contact with each other do not suffer from blocking.

[0036] In the label activation process section B, the heat-sensitive adhesive label 1 formed in the label formation section A is transported to a heating position with the print layer 13 thereof held in contact with the outer circumference of a rotary drum 34 and, after the heat-adhesive resin layer 16 is heated by a heating device 35 for the activation thereof , the heat-sensitive adhesive label 1 is transported to the label attaching process section C. At this time, the heat-adhesive resin layer 16 is imparted with sufficient adhesion simply by heating it at a temperature (65 to 60 C) which is lower than a heating temperature (70 to 65° C) for the heat-adhesive resin layer of the conventional heat-sensitive adhesive label, because the surface of the heat-adhesive resin layer 16 of the heat-sensitive adhesive label 1 has been subjected to the corona discharge process. This speeds up the label attaching process. In addition, the heat-sensitive adhesive label can be imparted with stronger adhesion than the conventional label, if it is heated at a temperature close to a heating temperature (70 to 65°C) for the heat-adhesive resin layer of the ordinary heat-sensitive adhesive label.

[0037] In the label attaching process section C, dry cell bodies X are successively supplied to an attaching drum 38 by a transport conveyer 36 and a transfer drum 37. The heat-sensitive adhesive label 1 is wrapped around the supplied dry cell body X by the attaching drum 38 and attaching guides 39, and attached to the outer circumference of the dry cell body X with opposite end portions thereof being overlapped with each other. At this time, widthwise opposite side edge portions of the heat-sensitive adhesive label 1 slightly project out of opposite ends of the dry cell body X.

[0038] The dry cell body X attached with the heat-sensitive adhesive label 1 is transported to the heat shrinkage process section D by a transfer drum 40 and a transport conveyor 41. In the heat shrinkage process section

D, a heating device 42 is provided as covering the transport conveyor 41. Since the heat-sensitive adhesive label 1 attached to the dry cell body X is heated at about 130°C by the heating device 42, the label base 11 is heat-shrunk whereby the opposite side edge portions of the heat-sensitive adhesive label 1 projecting out of the dry cell body X are tightly bonded to opposite end faces of the dry cell body X.

[0039] A heating belt 43 is provided in the heating device 42. The dry cell body X is rolled with the outer circumference thereof being heat-pressed by the heating belt 43, whereby the heat-adhesive resin layer 16 is activated again. Therefore, the heat-sensitive adhesive label 1 is firmly bonded to the outer circumference of the dry cell body X and, at the same time, the overlapped portions of the heat-sensitive adhesive label 1 are firmly bonded to each other. Thus, a dry cell assuredly attached with the heat-sensitive adhesive label 1 can be provided.

[0040] Although a definite distinction is herein given between the heat-sensitive adhesive label 1 and the label sheet 1a, it is also possible to regard the label sheet 1a as an elongated heat-sensitive adhesive label not subjected to the corona discharge process.

[0041] Fig. 2 illustrates a heat-sensitive adhesive label according to another embodiment. Although the aforesaid heat-sensitive adhesive label 1 which is a jacket label for a dry cell includes the metal vapor deposition layer 14 and the print layer 13 formed by printing various descriptions and designs with a UV-curable ink, a construction as shown in Fig. 2 can be employed for labels which are to be attached to articles other than the dry cell, for example, metal containers such as cans for beverage, food, paint and the like, and synthetic resin containers such as polyester containers for beverage, food, cosmetics and the like.

[0042] As shown, a heat-sensitive adhesive label 2 comprises a label base 21 formed of a biaxially oriented polyester film such as polyethylene terephthalate and having substantially no heat-shrinkability, and a print layer 22 and a heat-adhesive resin layer 23 successively provided on one surface of the label base 21. Like the heat-adhesive resin layer 16 of the heat-sensitive adhesive label 1, the heat-adhesive resin layer 23 is formed of an ethylene-acrylic acid copolymer or an ethylene methacrylic acid copolymer by melt extrusion coating so as to have a thickness of about 5 im to about 30 im, and subjected to the corona discharge process.

[0043] Besides the aforesaid polyester film, a plastic film such as of polypropylene, polyvinyl chloride or the like may be employed for the formation of the label base 21. The formation of the print layer 22 can be achieved by a known printing technique such as gravure printing. Further, a synthetic sheet, a paper sheet or the like may be used as the label base 21, and the print layer 22 may be formed on the front face thereof.

[0044] Since the heat-adhesive resin layer 23 of the heat-sensitive adhesive label 2 having the aforesaid construction has been subjected to the corona discharge process as in the case of the heat-sensitive adhesive label 1, the temperature for the activation of the heat-adhesive resin layer 23 can be reduced and the adhesive strength of the label can be increased as compared with the conventional label when the label is attached to the article.

[0045] In consideration of the blocking and the like, the heat-adhesive resin layer 23 of the heat-sensitive adhesive label 2 is desirably subjected to the corona discharge process when the label is attached to the article.

[0046] Since the heat-sensitive adhesive label 2 does not have heat-shrinkability, the heat shrinkage process to be performed when the label is attached to the article is of course obviated. Depending on the article to be labeled and the configuration of the label, the label is not necessarily required to be wrapped around the article and attached to the article with opposite end portions thereof being overlapped with each other, but may be attached to a part of the outer circumference of the article.

INDUSTRIAL APPLICABILITY

[0047] As describe above, the heat-sensitive adhesive label and the method of attaching the label according to the present invention are useful for wrapping and attaching a label entirely around a columnar or tubular article to be labeled, and particularly suitable for a jacket label for a dry cell having a metal surface and a method of attaching the jacket label.

Claims

1. A heat-sensitive adhesive label comprising a label base, and a heat-adhesive resin layer provided on the label base, wherein the heat-adhesive resin layer has been subjected to a corona discharge process.

2. A heat-sensitive adhesive label as set forth in claim 1, wherein the heat-adhesive resin layer is composed of an ethylene-acrylic acid copolymer, an ethylene-methacrylic acid copolymer, an ethylene-acrylate copolymer or an ethylene methacrylate copolymer.

3. A heat-sensitive adhesive label as set forth in claim 1 or 2, wherein the label base is formed of a heat-shrinkable synthetic resin film.

4. A method of attaching a heat-sensitive adhesive label, comprising the steps of:

   supplying a heat-sensitive adhesive label having a heat-adhesive resin layer provided on a label base thereof;

subjecting the heat-adhesive resin layer of the supplied heat-sensitive adhesive label to a corona discharge process;
heating the heat-adhesive resin layer subjected to the corona discharge process for activation of the heat-adhesive resin layer; and
attaching the heat-sensitive adhesive label having the activated heat-adhesive resin layer to an article to be labeled.

5. A method of attaching a heat-sensitive adhesive label as set forth in claim 4, wherein the heat-sensitive adhesive label having the activated heat-adhesive resin layer is wrapped entirely around the article, and attached to the article with opposite end portions thereof being overlapped with each other.

6. A method of attaching a heat-sensitive adhesive label, comprising the steps of:

supplying a heat-sensitive adhesive label having a heat-adhesive resin layer provided on a heat-shrinkable label base thereof;
subjecting the heat-adhesive resin layer of the supplied heat-sensitive adhesive label to a corona discharge process;
heating the heat-adhesive resin layer subjected to the corona discharge process for activation of the heat-adhesive resin layer;
wrapping the heat-sensitive adhesive label having the activated heat-adhesive resin layer around a dry cell body having a metal surface with opposite side edge portions of the heat-sensitive adhesive label projecting out of opposite ends of the dry cell body, and attaching the heat-sensitive adhesive label to the dry cell body with opposite end portions of the heat-sensitive adhesive label being overlapped with each other; and
heating the heat-sensitive adhesive label attached to the dry cell body to heat-shrink the heat-sensitive adhesive label so that the opposite side edge portions of the heat-sensitive adhesive label projecting out of the opposite ends of the dry cell body are tightly bonded to opposite end faces of the dry cell body.

7. A dry cell having a heat-sensitive adhesive label attached to an outer peripheral surface thereof, the heat-sensitive adhesive label having a heat-adhesive resin layer provided on a label base thereof, wherein the label base is formed of a heat-shrinkable synthetic resin film, wherein the heat-adhesive resin layer is composed of an ethylene-acrylic acid copolymer, an ethylene-methacrylic acid copolymer, an ethylene-acrylate copolymer or an ethylene methacrylate copolymer, and has been subjected to a corona discharge process.

Fig 1

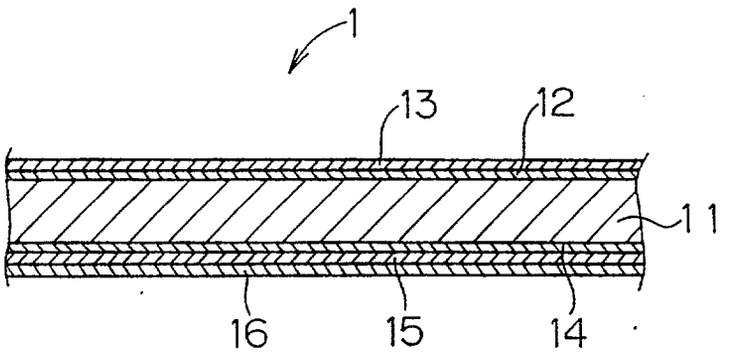


Fig 2

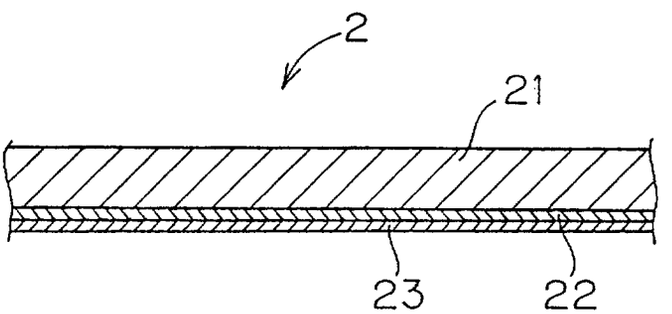
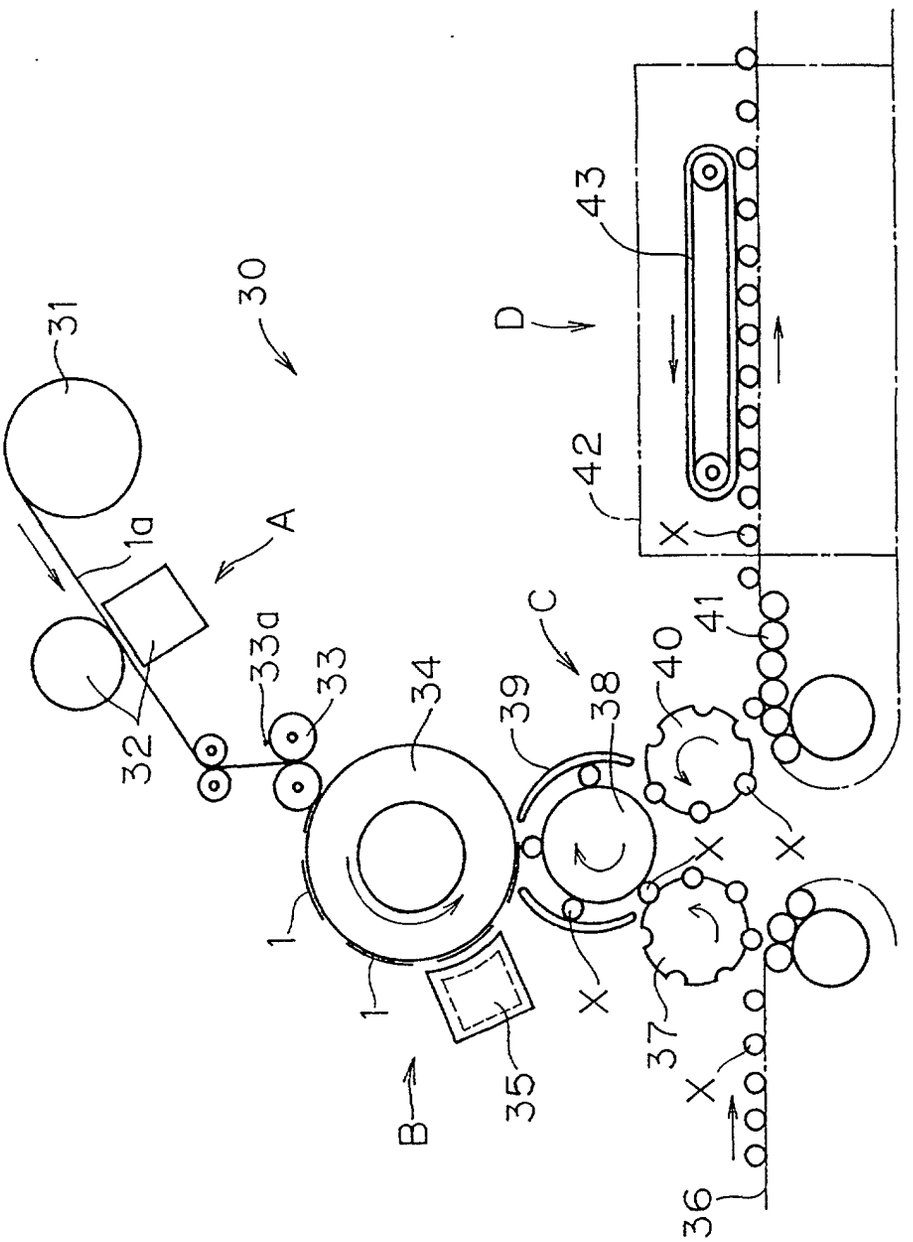


Fig 3



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP98/02878

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[6] G09F3/10, 3/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[6] G09F3/10, 3/04, D21H27/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1998 Toroku Jitsuyo Shinan Koho 1994-1998
Kokai Jitsuyo Shinan Koho 1971-1998

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, 60-109834, A (Gunze Ltd.), 15 June, 1985 (15. 06. 85), Page 3, lower right column (Family: none)	1-7
A	JP, 9-67799, A (Kosumo Kasei K.K.), 11 March, 1997 (11. 03. 97), Par. No. [0009] (Family: none)	1-7
Y	JP, 9-237614, A (Fuji Seal, Inc.), 9 September, 1997 (09. 09. 97) (Family: none)	5-7

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 September, 1998 (07. 09. 98)	16 September, 1998 (16. 09. 98)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)