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(71) Applicant: **Maynard, Arthur W.**
1 Nalbone Court
Yardville, New Jersey 08620 (US)

(72) Inventor: **Maynard, Arthur W.**
1 Nalbone Court
Yardville, New Jersey 08620 (US)

(74) Representative: **Hepworth, John Malcolm et al**
Hepworth Lawrence Bryer & Bizley, 36 Regent Place
Rugby Warwickshire CV21 2PN (GB)

(54) Method and apparatus for forming a transfer film having a design thereon available for transfer onto a substrate.

(57) A method and apparatus for forming a transfer film having a base film adapted to receive printing thereon specified through a computer printing control system operable to determine the desired printing design responsive to a computer input device such as a keyboard or mouse. The design allows for quick changing of the printed design by modification of the computer input to facilitate frequent variations in the printed design within a high speed system for printing of the transfer film. The design is adapted to remove from the transfer film reponsive to a press which may be a heat press or a pressure press adapted to remove the printed design for placement on a substrate as desired. To facilitate release of the printed design, a release coating may be positioned between the base film and the printed design. Also, a top coating may extend over the surface upon which the printed design is placed to facilitate protection thereof when mounted upon the substrate. Finally, an adhesive may be placed over the printed design to facilitate adhesion between the design and the substrate when pressed into position thereon.

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BACKGROUND OF THE INVENTION

1. Field Of The Invention

The present invention deals with the field of systems usable with the formation of rolls of transfer film carrying repeated designs thereon. These designs are adapted to be placed in abutment with respect to articles which provide a substrate such that repeated separate pieces or articles can receive a design in a relatively high speed operation. A primary example is the application of lettering or designs to the external barrel of a pen or lighters or mugs or bottlecaps or tubes for holding medicines or other products. Logos, names, or information can be printed on the external surface of these common articles in a high speed manner by the formation of a film of material carrying many repeated designs thereon. Normally registration marks are positioned between the design to maintain registration of the design with respect to the substrate during placement of the design thereon. The placement is normally achieved by a press which is preferably a heat press but could also be a pressure press.

The present invention provides a novel means for quickly and efficiently changing the design in a rapid manner thereby allowing for the printing of rolls of film when the number of designs repeated thereon can be small in number. No number is required, but an extensive number of designs be ordered in order to key up for a specific design. The usage of computer control design systems and computer control printing devices allows for the more rapid changeover from one design to the next thereby facilitating runs for designs of lower numbers such as under 500 units.

2. Description of the Prior Art

Prior art devices require extensive labor and hand manipulation for the changeover from one design to another design. These changeovers thereby provide a minimum number below which it is no longer economically feasible to print a design. A common number utilized in this field today is 500. Any run less than 500 is basically non-feasible, and thereby, this has been determined to be the minimum number of designs with which initial tooling can be performed profitably. The present invention provides a novel means for allowing quick changeover to facilitate the generation of transfer films having well less than 200 reproductions of a specific design printed thereon. This is made possible by the use of the computer controlled printers.

SUMMARY OF THE INVENTION

The present invention provides an apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate which includes a film supply device adapted to supply a translucent base film to facilitate application of the design thereon for placement upon a substrate. The base film preferably includes a transparent base layer, as well as a release layer extending over the transparent base layer. The release layer is positioned adjacent the base film to facilitate release thereof. The release layer is responsive to heating thereof or pressing thereof to facilitate removal of a design from the transparent base layer.

A top coating may be positioned extending over the release layer in such a manner as to be adapted to receive the design printed directly thereon. This top coating is adapted to be released from the base film along with the planned design to provide a protective top coating thereover after placement upon a substrate such as a pen or mug.

A printing device may be adapted to receive the base film from the film supply device in such a manner as to print at least one design upon the top coating to be avariable for transfer therefrom for application upon the substrate the printing device includes an ink jet printer or a laser jet printer adapted to spray ink upon the top coating for placement of at least one design thereon.

The present invention further includes a computer printing control device operable to determine a specific design which the printing device will print upon the base film or upon the top coating thereon. The computer printing control device includes graphic arts software to facilitate design formulation The computer printing control device further may include a central processing unit for operatively manipulating the graphic software.

The apparatus may further include a computer input device operable to specify a design to the computer printing control device for placement upon the base film by a printing device. An adhesive layer may be applied to the base film after placement of the printed design thereon by the printing means in such a manner as to be removable along which the printed design to facilitate adhesion between the substrate and a printed design. A registration application device may be adapted to place registration markings at regularly spaced locations along the base film to facilitate registration thereof with respect to the substrate upon removal of the printed design for placement thereon. The registration application device may place actual regularly spaced markings or regularly spaced perforations to provide this registration.

The method of the present invention for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate, includes the supplying of a base film to facilitate placement of a design thereon. A computer input means is then manipulated to specify a graphic design for printing upon the base film. The specific graphic design is

then generated through a computer graphics control software program and the specified graphic design is now printed upon the base film preferably repeatedly therealong. Thereafter, the transfer film is placed successively in abutment with respect to the desired substrate such as a mug or pen and a heat press or pressure press urges the printed design into abutment with respect to the substrate for adherence thereagainst. Proper alignment between the printing design and the substrate is maintained by the perforations or markings of the registration system

It is an object of the present invention to provide an apparatus and method for forming a transfer film having a design thereon available for transfer onto a substrate whereon rapid changeover from one printed design to another is facilitated.

It is an object of the present invention to provide an apparatus and method for forming a transfer film having a design thereon available for transfer onto a substrate whereon the cost of changeover from one printed design to another is minimized.

It is an object of the present invention to provide an apparatus and method for forming a transfer film having a design thereon available for transfer onto a substrate wherein initial capital outlay for equipment is minimized.

It is an object of the present invention to provide an apparatus and method for forming a transfer film having a design thereon available for transfer onto a substrate wherein short design runs can be performed in an economically competitive manner.

It is an object of the present invention to provide an apparatus and method for forming a transfer film having a design thereon available for transfer onto a substrate wherein a great variety of different designs for labeling and decorating is made possible.

It is an object of the present invention to provide an apparatus and method for forming a transfer film having a design thereon available for transfer onto a substrate wherein high quality design reproduction is made possible.

It is an object of the present invention to provide an apparatus and method for forming a transfer film having a design thereon available for transfer onto a substrate wherein a roll of labels or designs are provided which are relatively defect free.

It is an object of the present invention to provide an apparatus and method for forming a transfer film having a design thereon available for transfer onto a substrate wherein clear and bright transfer designs of consistently high quality are provided.

It is an object of the present invention to provide an apparatus and method for forming a transfer film having a design thereon available for transfer onto a substrate wherein durability of a design positioned upon a substrate is enhanced by a top coating extending thereover.

It is an object of the present invention to provide an apparatus and method for forming a transfer film having a design thereon available for transfer onto a substrate wherein multiple color designs can be achieved by the use of multiple printing stations.

It is an object of the present invention to provide an apparatus and method for forming a transfer film having a design thereon available for transfer onto a substrate wherein brilliant colors, metallics, and opaque pigmentation be utilized to enhance the visual impact of the final design.

BRIEF DESCRIPTION OF THE DRAWINGS

While the invention is particularly pointed out and distinctly claimed in the concluding portions herein, a perferred embodiment is set forth in the following detailed description which may be best understood when read in connection with the accompanying drawings, in which

Figure 1 is a cross sectional view of an embodiment of a transfer film produced by the apparatus and method practiced in accordance with the present invention,

Figure 2 is a graphic illustration of an embodiment of the apparatus and method of the present invention for forming a transfer film having a design thereon; and

Figure 3 is a top plan view of an embodiment of a transfer film made in accordance with the apparatus and method of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides an apparatus and method for forming a transfer film 10 as shown in cross section in Figure 1. The composite construction or transfer film 10 includes a base film 12 normally formed as a film roll 18 as shown in Figure 2. Base film 12 preferably includes a design 14 printed thereon such that design 14 can be transferred onto a substrate 16.

The transfer of the design 14 from base film 12 to substrate 16 is achieved by a press means 50 operable to urge heat transfer or pressure transfer of the design 14 onto the substrate 16 and adherence therebetween.

To facilitate the pressing operation, the transfer from 10 of the present invention may include a release layer 20 extending across the surface of base film 12. In this manner during the heating or pressing operation of press 50, the release layer will facilitate separation of the design 14 from the base film 12 to prevent sticking or unwanted retainment therebetween.

The placement of the design 14 upon substrate 16 sometimes gives rise to wear problems resulting in abrasion of the design 14 responsive to usage of the product carrying substrate 16. To facilitate retaining of

the design 14 upon the substrate 16, it is preferable that a top coating 22 be placed thereover. This top coating 22 is initially placed in abutment with respect to the release layer 20 or directly with respect to the transfer film 10. The design 14 is then printed directly onto the top coating 22. When the press 50 is operated, the top coating 22, which binds with respect to the design 14, will be removed with the design 14 and then placed on the substrate 16 will provide a top coating 22 extending over the design 14 in such a manner as to protect the design from abrasion.

The design 14 is placed on the transfer film 10 by a printing means 24 which preferably takes the form of an ink jet printer 26 or a laser jet printer 28. The printing means is adapted for high speed printing and is controlled by a computer printing control means 30 such as central processing unit 30. A computer input means 32, such as a mouse 46 or a keyboard 44, is operative to control computer input through computer input means 32. A conventional graphic arts software program will be placed within the computer printing control means 30 to facilitate generation of designs 14 as desired by the user. The computer control achieved through this computer printing control means 30 allows for rapid changeover from one design to another thereby making short production runs economically feasible when forming rolls 18 or transfer film 10.

To facilitate adhesion between the design 14 and the substrate 16, and adhesive layer 34 may be applied onto the transfer film 10 after printing of the design 14 thereon. This adhesive layer 34 may be applied by the adhesive layer application means 56. With this configuration when the press 50 urges removal of the design 14 from the transfer film 10 and urges it onto abutment with respect to the substrate 16, the adhesive layer will extend between design 14 and substrate 16 facilitating adhesion therebetween.

When a film roll 18 utilizes a plurality of individual designs 14, it is desirable to include a registration application means 36 which is adapted to place registration marks 38 or registration holes or apertures 40 in regularly spaced locations along the transfer film 10. In this manner, proper registration between the design 14 and the substrate 16 can be maintained during operation of press 50.

Furthermore, the apparatus of the present invention is often desired to perform multiple designs or multiple colored designs 14, and for this purpose multiple printing devices 42 may be utilized.

The computer printing control means 30 achieves greater capabilities in the formation of design 14 by the inclusion of a monitor 48 wherein the computer input means 32 may be operated in such a manner as to perform specific and highly advanced designs 14 capable of being transferred onto substrate 16.

With the ink jet printer 26 or the laser jet printer 28, the graphic ink 54 will be sprayed as shown in Figure 2 onto the transfer film 10. this spraying may be placed directly onto the base film 12 if no release or top coating is included. Or alternatively, may be placed directly on the release layer 20 if no top coat is included. If the top coat 22 is included, than the graphic ink 54 will form the design 14 directly on the top coat to facilitate simultaneous removal thereof when press 50 is operated.

As shown in Figure 2, the film roll 18 will provide a base film 12 adapted to move as shown by arrows 60 Initially the base film 12 will move to the release layer 20 application station 58 wherein the release layer 20 will be applied onto the base film 12. The transfer film 10 will then move through the top coating application station to wherein a top coating will be placed across the transfer film 10 specifically in abutment with respect to the release layer 20.

Thereafter the transfer film 10 will be carried to a printing means 24 such that an ink jet printer 26 for printing of a full or partial design 14 thereon. The transfer film 10 can then travel to one or more additional printing means as desired. A registration application means 56 may also be included thereafter. Finally, the transfer film 10 will pass through an adhesive layer application means 56 for the application of adhesive layer 34 to the rear surface of the design 14. The final roll 18 of film 10 will then be moved to a position as shown in Figure 1 wherein press 50 such as a heat press will be urged into abutment with respect to the transfer film 10 for urging abutment of the design 14 with respect to the substrate 16 and adherence therebetween. In this manner, any design or printed figure or information can be provided upon a desired substrate.

The material of the base film 12 can be a polyester or a polypropylene and can include the release layer 20 and/or top coating 22 as desired. The film type is normally a clear material such as polypropylene, however, it could be a paper material which is coated with a silicone layer or other lamination to facilitate release therefrom.

The printing device 24 of the present invention can take the form of more conventional computer printers such as dot matrix printers to facilitate rapid printing or designs or wording as required. Also, the material of the design 14 can be of materials other than graphic ink. For example, the materials could include metallic layers made possible by the application of silver nitrate solutions and the like.

The placement of the graphic design 14 on, the transfer film 10 of the present invention, can be made before or after the adhesive layer 34 is placed on the film 10. This in true in view of the fact that the inks used for such graphic designs tend to permeate the adhesive layer and become embedded and affixed thereto. As such, the adhesive layer application means 56 may take place before or after placement of the graphic design 14 onto the transfer film 10. In

fact if desired, the final user can have control of the computer printing control means 30 and the computer input means 32 in their place of business to predetermine the design as they may need. With such a system a clear transfer film 10 could be formed including a base film 12, a release layer 20, a top coating 22, and an adhesive layer 34. The customer would then be able to operate the computer printing control means 30 in order to specify one or more particular designs to be placed upon this final film Alternatively, of course, the entire printing system 24 could be placed adjacent to the apparatus for placing the layers upon the transfer film 10 in such a manner that all printing and layers could be placed upon the film 10 at the situs of the original equipment manufacturer. With either configuration, the multiple capabilities of the use of the computer Input means 32 and the computer printing control means 30 of the present invention could be effectively achieved.

One of the major advantages of the present invention is in the ability to economically changeover from one design to another in a very rapid action made possible by the computer controlled printing means. This changeover makes smaller production runs of leas than 500 designs produced much more economically and feasible.

While particular embodiments of this invention have been shown in the drawings and described above, it will be apparant, that many changes may be made in the form, arrangement and positioning of the various elements of the combination. In consideration thereof it should be understood the preferred embodiments of this invention disclosed herein are intended to be illustrative only and not intended to limit the scope of the invention.

Claims

1. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate comprising:
   a) a film supply means including a base film means to facilitate application of a design thereon for placement upon the substrate;
   b) a printing means adapted to receive said base film means from said film supply means and to print at least one design thereon to be available for transfer therefrom for application upon the substrate.
   c) a computer printing control means operable to determine a specific design which said printing device will print upon said base film means, and
   d) a computer input means operable to specify a design to said computer printing control means for placement upon said base film by said printing device.

2. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in Claim 1 wherein said base film is any one of, or any combination of, polyester, polypropelene, and paper.

3. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in Claim 2 where said base film is paper and wherein said paper includes a release coating to facilitate release of the printer design therefrom.

4. An apparatus as defined in Claim 3 wherein said release coating comprises silicone.

5. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in Claim 1 wherein said printing means is any one of, or any combination of, an ink jet printer, a laser jet printer, and a dot matrix printer.

6. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any preceding claim further including a release layer extending over said base film means adapted to receive the design printed thereon, said release layer extending between said base film means and the printed design to facilitate release therebetween.

7. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any preceding claim further including a top coating extending over said base film means and adapted to receive the design printed directly thereon, said top coating adapted to be released from said base film means along with the printed design to provide a protective top coating thereover after placement upon a substrate.

8. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any preceding claim further including an adhesive layer applied to said base film means after placement of the design thereon by said printing means to be removable along, with transfer of the printed design to facilitate adhesion between the substrate and the printed design.

9. An apparatus for forming a transfer film having at least one design theron available for transfer therefrom onto a substrate as defined in Claim 1 wherein the design on said base film means is

adapted for removal therefrom responsive to application of pressure and/or heat thereagainst.

10. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any preceding claim further including registration application means adapted to place registration markings at regularly spaced locations along said base film means to facilitate registration thereof with respect to the substrate upon removal of the printed design for placement thereon.

11. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in Claim 10 wherein said registration markings comprise punch holes regularly spaced along said base film means.

12. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any preceding claim wherein said printing means includes a plurality of individual printing devices adapted to print upon said base film means.

13. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in Claim 12 wherein each of said printing devices is adapted to print a different colour from one another upon said base film means.

14. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any preceding claim wherein said printing means is adapted to print a metallic design upon said base film means.

15. an apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate thereof as defined in Claim 14 wherein said printing means is adapted to dispense a silver nitrate solution onto the substrate during printing thereof.

16. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any preceding claim wherein said base film means is transparent.

17. An apparatus for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate comprising:

a) a film supply means including a translucent base film means to facilitate application of the design thereon for placement upon the substrate, said base film means including:

(1) a transparent base layer;

(2) a release layer extending over said transparent base layer, said release layer positioned adjacent said base film means to facilitate release thereof, said release responsive to heating thereof to facilitate removal of a design from said transparent base layer;

(3) a top coating extending over said release layer and adapted to receive the design printed directly thereon, said top coating adapted to be released from said base film means along with the printed design to provide a protective top coating thereover after placement upon a substrate;

b) a printing means adapted to receive said base film means from said film supply means and to print at least one design upon said top coating to be available for transfer therefrom for application upon the substrate, said printing means comprising an ink jet printer adapted to spray ink upon said top coating for placement of at least one design thereon;

c) a computer printing control means operable to determine a specific design which said printing device will print upon said base film means said computer printing control means including a graphic arts software program to facilitate design formulation;

d) a computer input means operable to specify a design to said computer printing control means for placement upon said base film by said printing device.

e) an adhesive layer applied to said base film means after placement of the design thereon by said printing means to be removable along with transfer of the printed design to facilitate adhesion between the substrate and the printed design, and

f) a registration application means adapted to place registration markings at regularly spaced locations along said base film means to facilitate registration thereof with respect to the substrate upon removal of the printed design for placement thereon.

18. A method for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate comprising:

a) supplying of a base film to facilitate placement of a design thereon;

b) operating of a computer input means to specify a graphic design for printing upon the base film;

c) generating the specified graphic design through a computer graphics control software program; and

d) printing of the specified graphic design upon the base film in specified areas thereof.

19. A method for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in Claim 18 further comprising applying of an adhesive layer after said printing to extend over the graphic design printed on the base film to facilitate adhesion thereof with respect to the desired substrate responsive to being placed in abutment therewith.

20. A method for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any of Claims 18 or 19 further comprising applying of a release layer extending over the base film layer prior to said printing to facilitate release of designs printed thereon.

21. A method for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any of Claims 18 to 20 further comprising applying of a top coating layer extending over the base film layer prior to said printing thereon to be removed simultaneously with the printed graphic to provide a top protection coating thereover after placement on the substrate.

22. A method for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any of Claims 18 to 21 further comprising pre-designation of a specific number of designs desired to be printed upon the base film.

23. A method for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any of Claims 18 to 22 further comprising removal of the printed graphic art desing from the base film by application of heat and/or pressure thereagainst for placement upon the substrate.

24. A method for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any of Claims 18 to 23 further comprising placing of registration markings at regularly spaced intervals along the base film to facilitate registration of the printed design during placement onto the substrates.

25. A method for forming a transfer film having at least one design thereon available for transfer therefrom onto a substrate as defined in any one of Claims 18 to 24 wherein said printing is performed by a plurality of individual printing devices each adapted to print a different colour from one another.

FIG 1

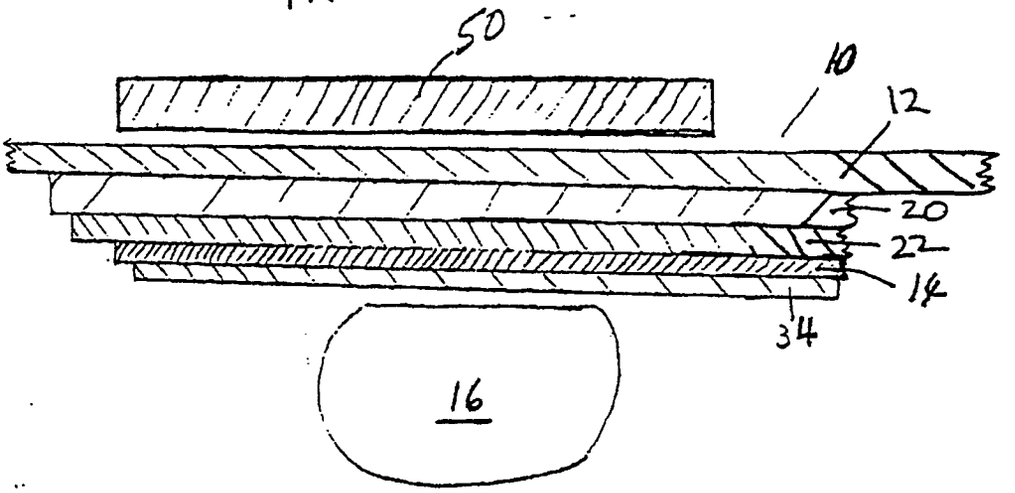


FIG 2

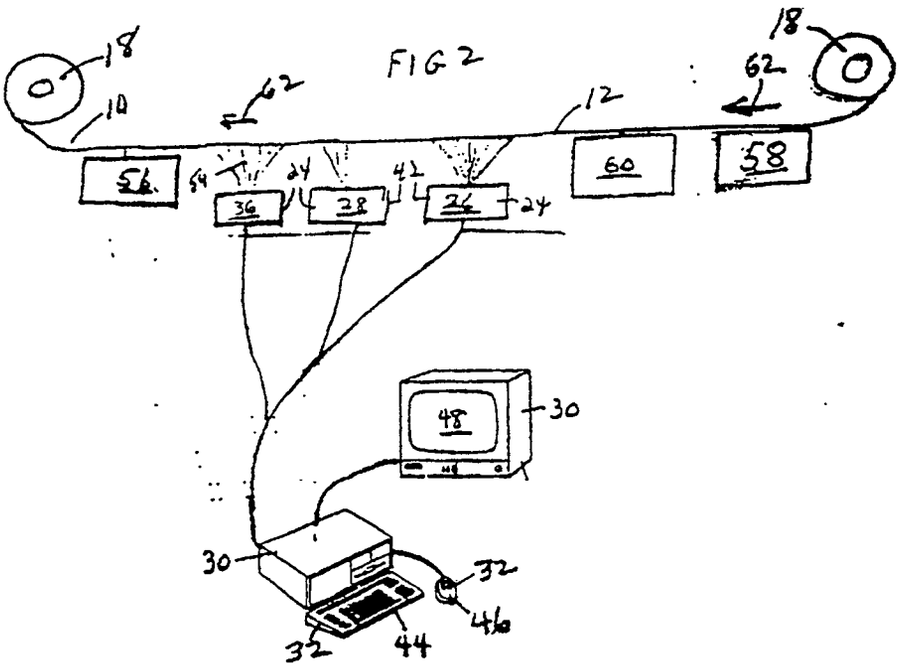
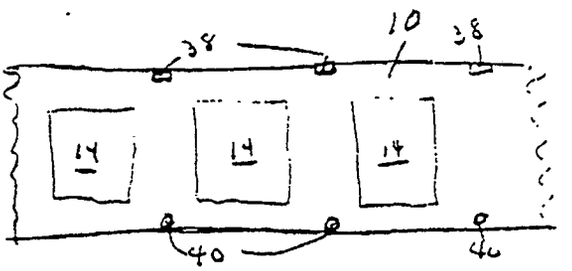


FIG. 3



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EUROPEAN SEARCH REPORT

Application Number

EP 91 30 5027

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	WO-A-9000473 (D.S.HARE) * the whole document *	1-25	B41M3/12 B41M5/035
X	US-A-4870427 (BROTHER KOGYO K.K.) * column 9, lines 5 - 25; figure 4 * * column 10, lines 13 - 21 *	1-25	
X	US-A-4758952 (C.F.HARRIS ET AL.) * column 1, line 53 - column 2, line 22; figure 1 *	1-25	
X	GB-A-2189436 (A.U.D'OLIVEIRA) * the whole document *	1-25	
X	PATENT ABSTRACTS OF JAPAN vol. 10, no. 176 (M-491)(2232) 20 June 1986, & JP-A-61 27278 (INTER TECHNICAL INDASUTORII K.K.) 06 February 1986, * the whole document *	1-25	
A	EP-A-279467 (DAI NIPPON INSATSU KABUSHIKI KAISHA) * page 21, lines 1 - 36 * * page 23, lines 7 - 16 *	10, 11, 24	TECHNICAL FIELDS SEARCHED (Int. Cl.5) B41M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03 SEPTEMBER 1991	BACON A.J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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