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Description

The present invention relates to transparent imaging sheets for use in mechanical copying machines. More particularly, the present invention relates to a composite sheet construction comprising a transparent sheet and an opaque member adhered thereto. Such composite, transparent sheets can be used in state-of-the-art copying machines employing photo sensing means to monitor the progress of imaging sheets through the feed mechanism.

Modern copying machines employ sophisticated mechanisms to allow them to select imaging sheets from a stack of such sheets and, by the use of rollers, wheels, belts, and the like, cause such sheets to rapidly and precisely be moved past various points in the machine to cause the sheets to be imaged, processed and subsequently deposited in a receptacle accessible to the machine operator. Such machines can produce a great number of copies in a relatively short time span. To accomplish this task, the sheets must be fed rapidly and precisely through the machine. Copy machines of this type can typically provide up to 120 copies per minute.

In order that the rapid handling and processing of the sheets can be accomplished, sophisticated sensing mechanisms have been built into such machines to prevent damage to of the machine of wrinkling, tearing or other deformation of the sheet occurs. For example, these sensing mechanisms will halt operation of the machine if jamming occurs so as to avoid any damage to the machine caused by such jamming. Many sensing mechanisms employ photo sensors which monitor the passage of the sheet through the machine. In order for such sensing mechanisms to operate the sheets must be opaque in certain areas so as to interrupt the light beams employed in the photo-sensing mechanisms. Accordingly, when transparent sheet materials are used in such copying machines they must be rendered opaque in selected areas in order to operate properly in the machines.

Some copying machines require that only a small portion of the transparent sheet be rendered opaque and the printing of a dark line along the top or side of such sheets is sufficient. Other machines require that a greater area of the sheet be rendered opaque or that prime image areas of the sheet be opaque. Obviously, this situation precludes using a transparent sheet with an unobtrusive opaque line printed along one edge. In order to use transparent sheets in such machines, a paper backing, substantially coextensive with the sheet, is adhered to the transparent sheet and removed therefrom following passage through the machine. Generally, the paper sheet is adhered to the transparent sheet by a thin line of adhesive applied continuously or discontinuously proximate a common edge of the mated sheets. When the transparent sheet has been imaged the operator tears the paper sheet from the transparent sheet and discards the paper sheet.

United States Patent Specification No. 3 618 752 discloses a stack of image-receiving members each adapted to be sheet fed seriatim from said stack, said stack comprising (1) a plurality of image transfer members in contact with adjacent members with all in vertical and horizontal registration, said image member including (2) a generally rectangular, transparent, non-fibrous flexible sheet no more than 6 mils thick, and (3) a sheet of paper backing substantially coextensive and in register with said non-fibrous flexible sheet and secured to said sheet along a common leading edge, (4) said transfer members positioned in said stack such that a flexible sheet of one transfer member is in contact with the paper backing of an adjacent transfer member. The transparent non-fibrous flexible sheet is generally selected from the group consisting of poly-sulfone and polyethylene terephthalate polyester resins. This Patent mentions the use of staples as a means of securing the paper sheet to the transparency film and also the use of tape or glue as an alternative to staples.

German Offenlegungsschrift No. 1 511 282 discloses a paper structure for use in a copying machine which comprises in combination

(a) a paper sheet imageable in a copying machine,

(b) a paper carrier sheet underlying and in register with sheet (a), and

(c) an adhesive composition interposed between both sheets, the peel strength of the adhesive bond being less than the tear strength of the carrier paper. After the copying step the paper can be easily separated from the carrier sheet.

The use of paper backing sheets in combination with a transparent imaging sheet has not provided a satisfactory imaging manifold. The Applicants have found that when the paper sheet is torn from the transparent sheet, visible paper fibres remain on the transparent sheet in the area of the adhesive bond. These residual visible paper fibres and any adhesive residue block the transmission of light through the transparency which is objectionable to the viewer. This problem does not arise with opaque imaging sheets such as paper as such sheets do not require the transmission of light for viewing.

When a discontinuous adhesive bond is used, for example a "dashed" adhesive line, the amount of paper fibres remaining on the transparent sheet following removal of the paper sheet is somewhat reduced. However, a more serious problem can develop in that such composite sheets have a greater tendency to jam in the feed mechanism of the copy machines.

The present invention relates to transparent imaging sheet manifolds or "sets" for use in copying machines such as the xerographic machines often referred to as "plain paper" copying machines in which the above described disadvantages are avoided.

According to the invention there is provided an

imaging sheet manifold comprising, in combination,

a) a transparent, polymeric sheet imageable in a copying machine,

b) an opaque, paper sheet underlying and in register with said transparent sheet,

c) an adhesive composition interposed between and bonding said paper sheet to said transparent sheet, characterised in that the peel strength of said adhesive bond is less than the tear strength of said paper and said adhesive has a greater affinity for the surface of the paper sheet than for the surface of the transparent sheet and the adhesive itself, whereby the affinity of the adhesive for itself is greater than the affinity of the adhesive for the surface of the transparent sheet.

The adhesive composition is selected to have a greater adhesive affinity for the surface of the paper sheet than for the other elements of the manifold, that is, the transparent sheet or the adhesive itself. In addition, the adhesive is formulated so that the peel strength of the adhesive bond is less than the adhesive bond strength which would tear the paper fibres when the sheets are separated. This careful balancing of adhesive properties allows the paper sheet to be peeled from the transparent sheet without leaving a visible paper residue on the transparent sheet, and without leaving any substantial adhesive residue on the transparent sheet.

The sheets of the manifold are preferably joined by a continuous line of adhesive such as a line of adhesive proximate a common edge.

A number of adhesives can be formulated to provide the characteristics noted above. For example, the natural rubber adhesives have been found to work well and certain other synthetic, polymeric adhesives have also been found to have the necessary characteristics. For example, poly(vinylacetate) polymers have been found to provide acceptable adhesives, particularly when modified by the addition of an ester to modify the adhesive characteristics of the poly(vinylacetate). In addition, an isooctylacrylate/acrylimide copolymer in combination with a release agent coated on the transparent sheet has proven to be a suitable combination.

The imaging sheet manifolds according to the present invention also have sufficient dimensional and structural stability so that they do not cause excessive jamming in a copying machine. When processed, the manifold sheets of the present invention can be readily separated without leaving a visible residue of paper fibres or adhesive attached to the transparent sheet.

The image-receiving portion of the manifold of the present invention is a transparent, polymeric sheet. Representative of such polymeric sheets are poly(ethylene terephthalate) and polycarbonate sheets ranging in thickness from about 2 to 5 mils (50—125 micrometers). The image-receiving surface of the sheets may be treated with various surface treatments, known per se, to improve their imaging ability. In addition, antistatic agents and friction reducing coatings may be employed as is well known in the art. Typical antistatic materials are quaternary ammonium salts while pulverized urea formaldehyde particles can be used to provide a friction reducing coating.

As noted herein, the transparent sheet must be rendered opaque by some means in order to be useful in a copying machines employing photosensing mechanisms to control the feed mechanism. This is accomplished by adhering an opaque, paper sheet to the underside (non image-receiving side) of the transparent sheet. The manifold is then opaque and the copy machine "sees" an opaque piece of paper passing through. Following imaging, the manifold is separated by peeling the paper sheet from the transparent sheet.

The paper sheets useful in the manifold can be selected from a wide variety of paper materials. The paper should be opaque and should have sufficient dimensional stability, heat resistance and the like to resist wrinkling on passage through the copying machine. The operating characteristics for the various copying machines may also dictate the paper to be employed. For example, copying machines having relatively high fusing station temperatures can utilize higher weight papers whereas copying machines having low fusing station temperatures may perform better with lower weight papers. Generally, papers in the weight range of 18 to 46 pounds (8—21 kg) per ream (500 sheets of 24″×36″ (61×91 cm) paper) are satisfactory.

It has been found that a machine glazed or calendered paper is preferable as there is less likelihood of paper tearing when the paper sheet is peeled from the transparent sheet.

The adhesive employed in the present invention must be formulated to have carefully balanced adhesive properties. On the one hand the adhesive must adhere the paper firmly to the transparent sheet so that the mated sheets will not be separated during routine handling and packaging or during imaging in the copy machine. On the other hand, the adhesive must allow the paper sheet to be readily torn from the transparent sheet without leaving paper fibers adhered thereto.

It has been found that the adhesive must have a bond strength to the transparent sheet material or a cohesive strength which will not exceed the tear strength of the paper employed. Thus, as long as the adhesive bond can be broken at the adhesive-adherend interface with a force that does not exceed this value, paper fibers will not be torn from the surface of the paper and be left on the transparent sheet. For example, an adhesive bond having a peel strength of less than about 1400 grams per inch width (550 g per cm) when measured in 180 degree peel at 100 inches/minute (254 cm/min) using 30 pound (13.6 kg) glazed paper and 3 mil (76 micrometer) thick polyester, is satisfactory. If the adhesive bonds more strongly than this, fibers will be torn from the paper when the sheets are separated.

The adhesive bond is preferentially broken at the interface between the adhesive and the transparent sheet so that substantially no adhesive residue is left on the transparent sheet. This can be readily accomplished with certain adhesive materials as will be seen hereinafter.

Adhesives having the necessary bonding properties can be formulated by skilled workers in the adhesives art once the desired criteria have been established. Such formulation work involves selecting an adhesive material which will have the necessary physical properties and affinity for the surfaces to be joined followed by modification of the polymer, if necessary, to "fine tune" the balance of adhesive properties.

A variety of polymers can be used as the base polymer with which to formulate the adhesive. Rubber and poly(vinyl acetate) are two such materials which are particularly useful for preparing water-based adhesives. Natural latex rubber is a particularly useful base material for water-based adhesives since it is resilient, tough and has good ageing properties. The tack can be easily adjusted by proper compounding and the ageing properties can be improved by the addition of antioxidants and other known additives. A useful formulation comprises 167 parts by weight of 60% solids natural rubber latex, 8.0 parts terpene tackifying resin, 0.2 parts antioxidant, 0.7 parts thermoplastic resin/ester material, 2.8 parts plasticizer, 2.3 parts 26 Degree Baume ammonia and 58 parts water.

A different class of adhesive which has also been found to perform satisfactorily is a modified poly(vinyl acetate) adhesive. The main ingredients of such an adhesive are about 46—51 parts by weight poly(vinyl acetate), 2—4 parts diethylene glycol dibenzoate, 2—3.5 parts dipropylene glycol dibenzoate and 44 parts by weight water. These adhesives are particularly desirable since they also tend to be substantially removed from the transparent polyester sheet when the paper sheet is peeled from the polyester sheet.

A number of other adhesives can be used in combination with release agents or other surface modifying coatings. For example, an isooctyl-acrylate/acrylimide copolymer in organic solvent can be used in combination with a low adhesion surface treatment such as a urethane based on poly(octadecyl isocyanate). Ethylene/vinylacetate copolymer hot-melt adhesives can also be formulated to provide the necessary adhesive properties.

In addition to the above adhesives, a unique class of adhesive materials based on the use of inherently-tacky, elastomeric, copolymer microspheres can be employed in the present invention. These tacky microspheres provide a pressure-sensitive adhesive which has a low degree of adhesion permitting ready separation of adhered objects. Microspheres of this type are disclosed in U.S. Patents 3,691,140 and 4,166,152, the disclosures thereof being hereby incorporated by reference. These tacky microspheres may be adhered or anchored to the paper sheet of the manifold by primers, adhesives or binders, see for example U.S. 3,857,731, to provide a low-tack paper sheet which can be used to prepare an imaging sheet manifold according to the present invention. Manifolds prepared using these microsphere coated paper sheets can be imaged and the paper sheet subsequently separated without leaving visible paper fibers or adhesive residue on the transparent sheet.

The maximum bond strength which can be built into the adhesive can be determined by testing the paper to be used in the manifold with adhesives having varying bond strengths. A 180 degree peel test with various adhesives will provide the value at which paper fibers are removed. With 30 pound (13.6 kg) machine glazed bond paper this value has been found to be about 1400 grams per inch width (550 g/cm) at 100 inches/minute (254 cm/min) at room temperature. Various adhesives can then be formulated to fail in cohesion or in adhesion to the selected transparent substrate (e.g. plain or release-coated polyester) at peel values below the tear strength value previously determined.

The imaging sheet manifolds of the present invention can be prepared on conventional forms-making equipment by extruding a continuous bead of the adhesive along one edge of the paper sheet or the transparent sheet and then mating the sheets and allowing the adhesive to dry. Water-based adhesives are preferred from a cost and pollution standpoint. Moreover, because there is considerable static electricity generated on certain formsmaking equipment an organic solvent-based system could pose a potential fire hazard.

The imaging sheet manifolds of the present invention can be satisfactorily used in copying machines employing photosensing apparatus. The manifolds are opaque and can be processed by the copy machine essentially similar to a paper sheet and do not cause excessive jamming. When processed, the manifold can be separated by peeling the paper sheet from the transparent sheet without leaving any paper residue on the transparent sheet which is visible to the naked eye.

The present invention can be further illustrated by reference to the following Examples.

Example 1

An adhesive for bonding an imaging sheet manifold was prepared by blending a 56% solids aqueous emulsion of poly(vinylacetate), available from the H. B. Fuller Co. as adhesive S6920, with a 56% solids aqueous emulsion wherein the solids comprise 76% poly(vinylacetate) and 20% of a 55:45 weight ratio blend of diethyleneglycol dibenzoate and dipropyleneglycol dibenzoate, available from the H. B. Fuller Co. as adhesive PA 3473. Various blends ranging from 10% by weight adhesive PA 3473 and 90% adhesive S6920 to 90% by weight adhesive PA 3473 and 10% adhesive S6920 were prepared.

The peel strengths of these adhesive blends as well as each adhesive separately were tested by bonding sheets of 30 pound (13.6 kg) machine-glazed bond paper (Thilmany Paper Company) to 3 mil (76 micrometer) polyester. One inch (2.5 cm) strips were pulled in 180° peel at 100 inches/minute (254 cm/min) (room temperature) and the average peel force in grams measured. The results are shown in Table 1.

Manifold sheets were prepared by bonding a 35 pound (15.9 kg) machine-glazed bond paper to 3-mil (76 micrometer) polyester with an adhesive comprising 60 parts by weight adhesive PA 3473 and 40 parts adhesive S6920. A continuous, 1/8 inch (0.3 cm) bead of adhesive was placed along one long edge of an 8 1/2 inch by 11 inch (22×28 cm) sheet of the paper and mated in register with the polyester sheet to form a manifold. When dried, these sheets could be imaged in a copy machine and peeled apart without leaving any visble paper residue or adhesive residue on the polyester sheet. These manifolds were continuously fed to a Sharp 810 copier and no machine jams occurred during the feeding of 1200 consecutive manifolds at which time the test was discontinued. A competitive manifold having a discontinuous adhesive line was similarly fed through the same copier and during the making of 60 copies, 3 machine jams occurred.

Example 2

A natural latex rubber adhesive for bonding an imaging sheet manifold was prepared which comprised 167 parts of 60% solids natural rubber latex, 8 parts terpene resin (Piccolyte S115), 2.8 parts plasticizer (Plastinox 2246), 0.65 parts thermoplastic resin/ester material (Polypale Wood Rosin), 0.16 parts antioxidant (Santovar A antioxidant), 2.3 parts 26 Degree Baume Ammonia and 58 parts water.

As prepared, the above adhesive had a viscosity of less than 100 mPas. The viscosity was increased for flow control on the formsmaking equipment to about 5000 mPas by the addition of hydroxy ethyl cellulose (Union Carbide, QP 52000-H) or sodium polyacrylate (Diamond Shamrock, Modicol VD).

The peel strength of this adhesive was tested as in Example 1 and the results are shown in Table 1.

Manifold sheets were prepared by bonding a 35 pound (15.9 kg) machine-glazed paper (Thilmany) to 3-mil (76 micrometer) polyester as in Example 1. The manifold sheets could be imaged in a copying machine and the paper sheet peeled from the polyester without leaving a paper residue on the polyester sheet.

Example 3

A manifold according to the present invention was prepared by treating a polyester sheet on the surface along one edge with a polyoctadecyl-isocyanate-based urethane. This surface treatment provided a low adhesion surface treatment. An isooctylacrylate/acrylimide copolymer in organic solvent was applied to a sheet of bond paper. Following drying at ambient temperature the sheets were mated in register to form an imaging sheet manifold.

The above sheets could be imaged in a copying machine and the paper sheet subsequently peeled from the polyester sheet without leaving any visible paper residue.

TABLE 1

Adhesive	Peel force, grams	Comments
Natural rubber	1230	No paper residue
PA 3473	—	Paper tore—could not remove
S 6920	<10	No paper residue
10/90*	<10	No paper residue
20/80*	<10	No paper residue
30/70*	<10	No paper residue
40/60*	<10	No paper residue
50/50*	320	No paper residue
60/40*	1320	No paper residue
70/30*	—	Paper tore—Could not remove
80/20*	—	Paper tore—Could not remove
90/10*	—	Paper tore—Could not remove

* Weight ratios PA3473/S6920.

Claims

1. An imaging sheet manifold comprising, in combination,

a) a transparent, polymeric sheet imageable in a copying machine,

b) an opaque, paper sheet underlying and in register with said transparent sheet,

c) an adhesive composition interposed between and bonding said paper sheet to said transparent sheet, characterised in that the peel strength of said adhesive bond is less than the tear strength of said paper and said adhesive has a greater affinity for the surface of the paper sheet than for the surface of the transparent sheet and the adhesive itself whereby the affinity of the adhesive for itself is greater than the affinity of the adhesive for the surface of the transparent sheet.

2. An imaging sheet manifold as claimed in Claim 1, characterised in that the adhesive forms a continuous bond line having a length substantially equal to the length or width of the paper sheet.

3. An imaging sheet manifold as claimed in Claim 1 or Claim 2, characterised in that the adhesive comprises an organic polymeric adhesive.

4. An imaging sheet manifold as claimed in Claim 3, characterised in that the organic polymeric adhesive is selected from poly(vinyl acetate), natural rubber, isooctyl acrylate/acrylimide copolymer and ethylene/vinylacetate copolymer.

5. An imaging sheet manifold as claimed in Claim 3, characterised in that said adhesive comprises

46 to 51 parts by weight poly(vinylacetate),

2 to 4 parts by weight diethyleneglycol dibenzoate,

2 to 3.5 parts by weight dipropylene glycol dibenzoate, and

sufficient water to form an emulsion.

6. An imaging sheet manifold as claimed in Claim 3, characterised in that the adhesive comprises

167 parts by weight of 60% by weight solids natural rubber latex,

8 parts by weight terpene tackifying resin,

2.8 parts by weight plasticizer,

2.3 parts by weight ammonia, and

sufficient water to form an emulsion.

7. An imaging sheet manifold as claimed in any preceding claim, characterised in that the transparent, polymeric sheet imageable in a copying machine is a polyester sheet and the adhesive composition is interposed between and bonding said paper sheet to said transparent sheet along a thin, continuous bond line proximate a common edge of said sheets.

8. An imaging sheet manifold as claimed in any preceding claim, characterised in that the peel strength of the adhesive bond is less than about 550 grams per lineal centimeter.

Patentansprüche

1. Mehrlagige Kopierfolienbahn mit

a) einer transparenten Bahn aus einem Polymerisat, die in einem Kopiergerät mit einer Abbildung versehen werden kann,

b) einer undurchsichtigen Papierbahn, die unter der durchsichtigen Bahn liegt und mit dieser ausgerichtet ist, und mit

c) einer Klebstoffzusammensetzung, die zwischen der Papierbahn und der transparenten Bahn angeordnet ist und diese miteinander verklebt, dadurch gekennzeichnet, daß die Ablösfestigkeit der Klebstoffverbindung geringer ist als die Reißfestigkeit des Papiers und daß der Klebstoff eine größere Affinität gegenüber der Oberfläche der Papierbahn als gegenüber der der transparenten Bahn und dem Klebstoff selbst aufweist, wobei die Affinität des Klebstoffs selbst größer ist als die Affinität des Klebstoffs gegenüber der Oberfläche der transparenten Bahn.

2. Mehrlagige Kopierfolienbahn nach Anspruch 1, dadurch gekennzeichnet, daß der Klebstoff eine durchgehende Klebelinie bildet, deren Länge im wesentlichen gleich der Länge oder der Breite der Papierbahn ist.

3. Mehrlagige Kopierfolienbahn nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Klebstoff ein organischer Polymerklebstoff ist.

4. Mehrlagige Kopierfolienbahn nach Anspruch 3, dadurch gekennzeichnet, daß der organische Polymerklebstoff ausgewählt ist aus Polyvinylacetat, Naturkautschuk, Isooctylacrylat/Acrylimid-Copolymerisat und Äthylen/Vinylacetat-Copolymerisat.

5. Mehrlagige Kopierfolienbahn nach Anspruch 3, dadurch gekennzeichnet, daß der Klebstoff folgende Bestandteile enthält:

46 bis 51 Gewichtsteile Polyvinylacetat,

2 bis 4 Gewichtsteile Diäthylenglykoldibenzoat,

2 bis 3,5 Gewichtsteile Dipropylenglykoldibenzoat und genügend Wasser zur Bildung einer Emulsion.

6. Mehrlagige Kopierfolienbahn nach Anspruch 3, dadurch gekennzeichnet daß der Klebstoff folgende Bestandteile enthält:

167 Gewichtsteile von Naturkautschuklatex mit 60 Gewichtsprozent Feststoffen,

8 Gewichtsteilen Terpen-Klebrigmacherharz,

2,8 Gewichtsprozent Weichmacher,

2,3 Gewichtsteilen Ammoniak und genügend Wasser zur Bildung einer Emulsion.

7. Mehrlagige Kopierfolienbahn nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die transparente Polymerisat-Bahn, die in einem Kopiergerät mit einer Abbildung versehen werden kann, eine Polyesterbahn ist und daß die Klebstoffzusammensetzung zwischen der Papierbahn und der transparenten Bahn und diese miteinander verbindend entlang einer dünnen, durchgehenden Klebstofflinie angeordnet ist, die in der Nähe einer gemeinsamen Kante der Bahnen liegt.

8. Mehrlagige Kopierfolienbahn nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Ablösfestigkeit der Klebstoffverbindung geringer ist als etwa 550 g/Lineal-cm.

Revendications

1. Manifold de feuille de copie comprenant en combinaison,

a) une feuille polymère transparente pouvant être impressionnée dans une machine à copier,

b) une feuille de papier opaque sous-jacente et coïncident avec ladite feuille transparente,

c) une composition adhésive interposée entre ladite feuille de papier et ladite feuille transparente qu'elle unit, caractérisé en ce que la force de délaminage de ladite union adhésive est inférieure à la force de déchirure dudit papier et ledit adhésif a une plus grande affinité pour la surface de la feuille de papier que pour la surface de la feuille transparente et pour l'adhésif lui-mêm,e l'affinité de l'adhésif pour lui-même étant supérieure à l'affinité de l'adhésif pour la surface de la feuille transparente.

2. Manifold de feuille de copie selon la revendication 1, caractérisé en ce que l'adhésif forme une ligne d'union continue ayant une longueur essentiellement égale à la longueur ou à la largeur de la feuille de papier.

3. Manifold de feuille de copie selon la revendication 1 ou la revendication 2, caractérisé en ce que l'adhésif comprend un adhésif polymère organique.

4. Manifold de feuille de copie selon la revendication 3, caractérisé en ce que l'adhésif polymère organique est choisi parmi les poly(acétate de vinyle), caoutchouc naturel, copolymère acrylate d'isooctyle/acrylimide et copolymère éthylène/acétate de vinyle.

5. Manifold de feuille de copie selon la revendication 3, caractérisé en ce que ledit adhésif comprend:

46 à 51 parties en poids de poly(acétate de vinyle),

2 à 4 parties en poids de dibenzoate de diéthylèneglycol,

2 à 3,5 parties en poids de dibenzoate de dipropylèneglycol, et suffisamment d'eau pour former une émulsion.

6. Manifold de feuille de copie selon la revendication 3, caractérisé en ce que l'adhésif comprend:

167 parties en poids d'un latex de caoutchouc naturel à 60% en poids de matières sèches,

8 parties en poids d'une résine de terpène poissante,

2,8 parties en poids de plastifiant,

2,3 parties en poids d'ammoniaque et suffisamment d'eau pour former une émulsion.

7. Manifold de feuille de copie selon l'une quelconque des revendications précédentes, caractérisé en ce que la feuille polymère transparente pouvant être impressionnée dans une machine à copier est une feuille de polyseter et la composition adhésive est interposée entre ladite feuille de papier et ladite feuille transparente qu'elle unit, selon une ligne d'union continue mince, au voisinage d'un bord commun desdites feuilles.

8. Manifold de feuille de copie selon l'une quelconque des revendications précédentes, caractérisé en ce que la force de délaminage de l'union adhésive est inférieure à environ 550 grammes par centimètre linéaire.