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(54) **Tabbed transparency.**

(57) An imaging sheet manifold comprising a transparent polymeric sheet imageable in a copying machine and an opaque paper sheet adhered thereto. The adhesive bond adhering the sheets together has a peel strength less than the tear strength of the paper whereby, following imaging, the paper sheet can be peeled from the transparent sheet without leaving a visible paper residue.

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TABBED TRANSPARENCY

Technical Field

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.

Background Art

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 if 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.

The use of such paper backing sheets has not provided a satisfactory imaging manifold. When the paper sheet is torn from the transparent sheet, visible paper fibers remain on the transparent sheet in the area of the adhesive bond. When a discontinuous adhesive bond is used, for example, a "dashed" adhesive line, the amount of paper fibers 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.

Disclosure of Invention

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. More particularly, the present invention relates to an imaging sheet manifold comprising, in combination, a transparent, polymeric sheet imageable in a copying machine; an opaque, paper sheet; and an adhesive composition interposed between and adhering the paper sheet to 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 fibers 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, preferably 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 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 fibers attached to the transparent sheet.

Detailed Description

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 (50-200 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" x 36" (70 x 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 by the present inventor 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 cohesively or at the adhesive-adherend interface with a force that does not exceed this value, paper fibers will not be torn from the surface of he 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 (40 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. It is

preferred that the adhesive bond be 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 well 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 adhesives. 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

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, the peel strength of said adhesive bond being less than the tear strength of said paper.

2. An imaging sheet manifold according to Claim 1 wherein said adhesive forms a continuous bond line having a length substantially equal to the length or width of said paper sheet.

3. An imaging sheet manifold according to Claim 1 wherein said adhesive comprises an organic polymeric adhesive.

4. An imaging sheet manifold according to Claim 3 wherein said organic polymeric adhesive is selected from the group consisting of poly(vinyl acetate), natural rubber, isooctyl acrylate/acrylimide copolymer and ethylene/vinylacetate copolymer.

5. An imaging sheet manifold according to Claim 3 wherein said adhesive comprises about 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 according to Claim 3 wherein said adhesive comprises about 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 comprising, in combination,

a) a transparent, polyester sheet imageable in a copying machine;

b) an opaque sheet of bond paper underlying and in register with said transparent sheet;

c) an organic, polymeric adhesive composition interposed between and bonding said paper sheet to said transparent sheet along a thin, continuous bond line proximate a common edge of said sheets, the peel strength of the adhesive bond being less than the tear strength of the paper whereby the paper sheet can be peeled from the polyester sheet without leaving a visible paper residue thereon.

8. An imaging sheet manifold according to Claim 7 wherein the peel strength of the adhesive bond is less than about 550 grams per lineal centimeter.

9. An imaging sheet manifold according to Claim 7 wherein said adhesive comprises about 167 parts by weight of 60% by weight solids natural rubber latex 8 parts by weight terpene tackifying resin, 2.8 arts by weight plasticizer, 2.3 parts by weight ammonia and sufficient water to form an emulsion.

10. An imaging sheet manifold according to Claim 7 wherein said adhesive comprises about 46 to 51 parts by weight poly(vinylacetate), 2 to 4 parts by weight diethylene glycol dibenzoate, 2 to 3.5 parts by weight dipropylene glycol dibenzoate and sufficient water to form an emulsion.

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EUROPEAN SEARCH REPORT

Application number
EP 81 30 4909

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	GB - A - 1 145 833 (XEROX) * claims; page 1, line 15 to page 2, line 68; figures *	1-3
	DE - A - 1 511 282 (HENTSCHEL) * claims; page 4, paragraph 2 to page 5, paragraph 2; figures *	1-3
A	FR - A - 2 299 668 (SHADE) * claims; page 2, line 18 to page 3, line 30 * & GB - A - 1 536 582	1
A	FR - A - 1 363 699 (B.X. PLASTICS) * abstract * & GB - A - 1 049 783	1
D/A	US - A - 3 857 731 (R.F.MERRILL) * claims; column 2, line 20 to column 5, line 26; examples *	4-6, 8-10

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

G 03 G 7/00

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

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15/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24-12-1981	VANHECKE