

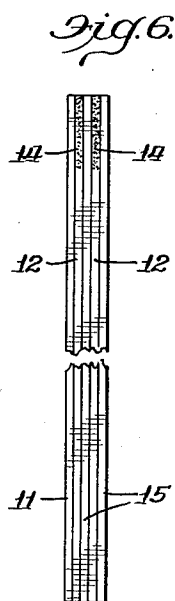
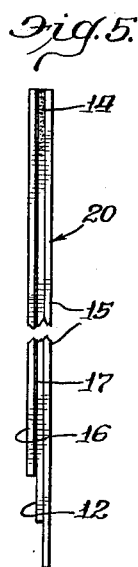
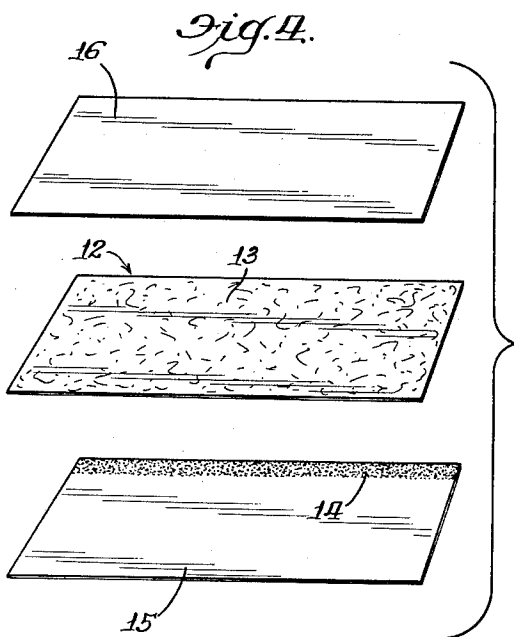
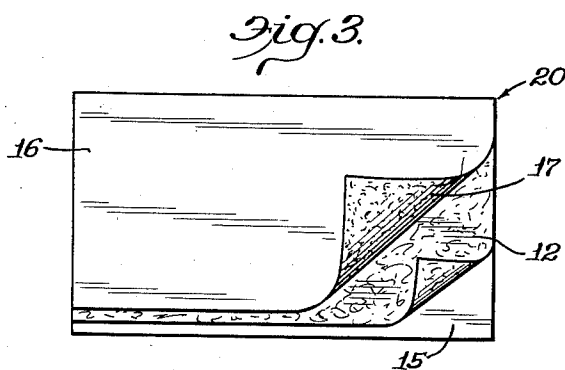
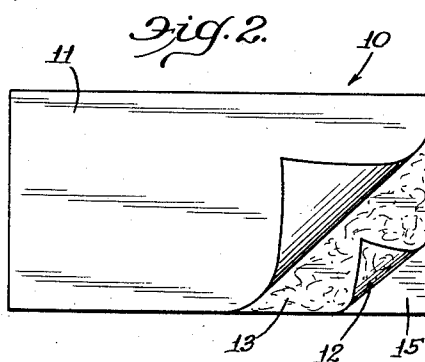
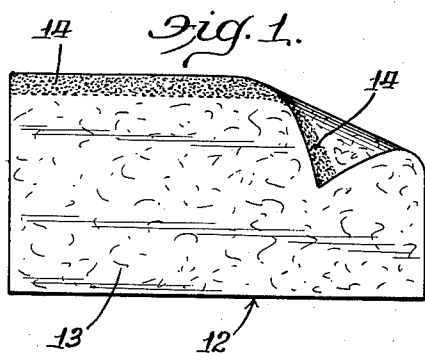
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CARBON SHEET AND ASSEMBLY

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3,094,342

CARBON SHEET AND ASSEMBLY

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This invention is concerned with carbon copy sheets, particularly with carbon copy sheets which are adapted to be utilized in the manufacture of preassembled carbon copy books, including an original impression sheet, at least one carbon sheet and optionally one or more other sheets.

Carbon copy books are useful in various ways and have advantages which cannot be obtained easily with hand assembled loose sheets. With carbon copy books, interoffice correspondence is expedited by routing a carbon copy book upon which is typed a memorandum to be answered. It is then possible to type the answer on the same sheet, disassemble the original and carbon copies and return one of the copies to the originator with considerable saving of effort over the use of separate memoranda. Another use of carbon copy books is in piggyback operations where a smaller carbon copy book is attached to a larger one so that extra copies of a specific portion of the larger book will be available. A special type of piggyback carbon copy book has as its original impression sheet a stencil. With this type of piggyback carbon copy book a stencil is cut and one or more carbon copies are made by the same impression. Both types of carbon copy books have component sheets temporarily joined along a marginal edge. Generally, memorandum type carbon copy books have the component sheets glued together along one edge. The sheets are each perforated on an area outside the glued margin so that they may be separated by tearing along the line of perforations. This type of carbon copy book is not adapted for piggyback operations since no means of fastening to another sheet is provided. Considerable waste is involved in the torn off portions. Furthermore, once the sheets are separated there is no means for uniting them again to make corrections or additions.

In the true piggyback type of carbon copy book, the component successive underlying sheets each project slightly beyond the immediately overlying sheet on one edge. A strip of pressure sensitive adhesive tape is adhered to these projecting edges thus uniting the component sheets. The bottom sheet acts as a protector for the immediately overlying carbon sheet as well as for the projecting edge of adhesive tape. By peeling off the protective sheet, the carbon copy book is ready to be adhered to a larger sheet or surface which is to receive a carbon copy of the impression. In the case of stencil assemblies of this type, the top sheet is a stencil which is cut by the same impression producing the carbon copy. One of the disadvantages of the tape-strip type of carbon copy book is that when the book is adhered to a sheet, the space occupied by the tape is not available for impressions. Likewise, if the component sheets are the same size a similar area exists at the bottom of the book. Furthermore, the thickness of the tape tends to cause a smudge underlying the edge of the tape when the book is pressed by movement through a nip such as the nip of a typewriter. The unequal thickness also causes stacking and packing difficulties. A further disadvantage is that once the book is disassembled it is difficult to reassemble for additions or corrections unless the component sheets are made to have bottom edges superimposed for alignment purposes. Where this is done, the component sheets must be of different sizes.

It is an object of this invention to provide a substantially

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flat carbon copy book whose surface is wholly usable for receiving impressions.

It is another object of this invention to provide a carbon copy book which may be used either in a piggyback operation or as a memorandum assembly and which, after disassembly, may be reassembled readily with the components in their proper relative positions.

It is a further object of this invention to provide a carbon copy book whose top sheet may be readily interchanged to provide a stencil sheet assembly or to provide a succession of sheets, each of which is to receive only a partial impression with the carbon copy recording the entire series of impressions.

It is a still further object of this invention to provide a carbon copy sheet which has the unique property, when placed between two impression sheets, of binding the three sheets together into a carbon copy book.

These and other objects and advantages of the invention will be apparent from the drawings and the descriptions thereof.

In the drawings:

FIGURE 1 is a plan view of a typical carbon sheet of this invention with a corner turned back to show both adhesive margins.

FIGURE 2 is a plan view of a typical carbon copy book of this invention in which similarly sized component sheets are turned back to show the sheet arrangement.

FIGURE 3 is a plan view of a special carbon book of this invention constituting a stencil assembly in which the bottom edges of the component sheets project progressively and with turned-back corners revealing the sheet arrangement.

FIGURE 4 is an isometric view of the component sheets of FIGURE 3 in preassembled condition showing the special case in which the adhesive appears on the bottom sheet rather than the carbon sheet prior to assembly.

FIGURE 5 shows an edge view of the stencil assembly of FIGURE 3.

FIGURE 6 is an edge view of a stencil of the type illustrated in FIGURE 1 but with additional carbon and impression sheets.

The objects of this invention are attained by providing a carbon sheet which has pressure sensitive adhesive properties on a portion of each of its major surfaces. In the preferred construction, the adhesive surfaces are on opposite sides of the carbon sheet along the same edge of the sheet, but the adhesive may be more widely scattered over both surfaces and not necessarily superimposed. The edge portion is preferred for the adhesive because if a stencil is used which has a special affinity for the adhesive used, the stencil may become slightly tacky where it contacts the adhesive. At the edge this is unimportant, however, since the stencil is always clamped into position by its edges.

The carbon sheet may be made of any porous sheet material such as woven and non-woven sheets of natural or synthetic fibers, but a fairly open thin sheet is preferred, as will be explained, and, in fact, the best material is tissue paper such as yoshino.

Thin porous material is preferred for carbon sheets because it provides a natural base for both the carbon and the pressure sensitive adhesive. With such porous open material pressure sensitive adhesive enters into the pores when applied from one side and makes both sides pressure sensitive in the area of application with a minimum of surface thickening. Furthermore, a porous base of this type provides anchorage for the adhesive causing it to separate cleanly from the other surface to which it may be adhered. The invention is not restricted to porous carbon sheets, however, but smoother base sheets may require a primer coating on both sides as well as

an adhesive coating on both sides to avoid excessive pick-off of adhesive onto the impression sheets.

In practice it is preferred to produce a carbon sheet of very simple structure wherein very finely divided carbon, such as lamp black or any of the commercially available carbon blacks or mixtures thereof, is adhered to a porous sheet such as tissue paper by a hydrocarbon oil. A rather viscous hydrocarbon oil is preferred because these oils are better binders. A Saybolt viscosity at 210° F. of from 70 to 130 is preferred. A commercially available oil in this range is Mobilsol K, an aromatic hydrocarbon oil obtainable from Mobil Oil Company, 59 East Van Buren Street, Chicago, Illinois. A preferred method of coating the carbon-oil mixture is by applying it in a solvent for the hydrocarbon oil. Solvents for such oils are numerous and well known. Such solvent as toluene, benzene, xylene and the like may be used, but the chlorinated solvent known as triethane is preferred for its low toxicity and because its use eliminates fire hazard. The proportions of oil, solvent and carbon are not critical but it is preferred to make a thick cream of the oil and carbon of about the consistency of honey. A pint of carbon in three pints of oil is satisfactory. This cream is then diluted with solvent until a thin liquid mixture suitable for spreading is obtained. A reverse roll spreader is preferred for coating, but any other method suitable for coating tissue such as extrusion coating, gravity coating, spray coating, doctor coating, contact coating and the like, may be used. It is desirable to use a doctor blade to wipe off excess coating, whichever method is used. At any rate, by the preferred method a roll dips into a well of the coating suspension so as to receive a layer of coating on its surface. This layer is largely wiped off by a second roll whose surface at the nip is moving opposite to that of the first coated roll. This second roll in turn deposits its coating on the underside of the tissue as the latter touches its top surface. The tissue then passes over a doctor blade which removes excess coating. The tissue may have its solvent removed by air drying, but a vacuum oven with a temperature above the evaporation temperature of the solvent is recommended. Hardly any thickness is imparted to the tissue by this coating operation in the preferred carbon sheets of the invention.

In applying the adhesive, a number of methods are available. It may be sprayed on in a narrow band from a solvent solution, or it may be applied by any of the other methods previously mentioned for applying the carbon solution. A rather unique method by transfer is also possible. In using this method a sheet of smooth paper or glazed paper or film coated paper is coated with a pressure sensitive adhesive. This may be coated from a solvent solution or a latex by any of the usual coating methods, or it may be calendered onto the paper. At any rate, the paper is thinly coated with an adhesion along one edge. If this sheet is now brought into contact with a porous carbon sheet either before or after any volatile liquid has been driven off, the adhesive, after losing volatile portions, will transfer to the carbon sheet when the sheets are separated. This occurs because the carbon sheet provides better anchorage for the adhesive and thus pulls it away from the other sheet. The other sheet thus serves as a protective sheet for the carbon sheet as well as an adhesive transfer sheet.

Pressure sensitive adhesives of a wide variety are suitable for application to the carbon sheets of this invention. Typical of these are such pressure sensitive adhesives as the latex crepe, wood rosin adhesives disclosed in U.S. Patent No. 2,177,627 and the polyisobutylene-coumarone indene resin adhesives disclosed in U.S. Patent No. 2,319,959. Other pressure sensitive adhesives which are suitable are the rubber, GRS and terpene resin adhesives disclosed in U.S. Patent No. 2,567,671 or the plasticized vinyl ether adhesives disclosed in U.S. Patent No. 2,697,084 or the alkyd resin elastomer-rosin derivative adhesives of U.S. Patent No. 2,392,639 or even the rubber

latex pressure sensitive adhesive disclosed in U.S. Patent No. 2,429,223.

Where stencil assemblies of the invention are involved, the stencil sheet may be any of the normally used transfer type stencils or other porous sheets utilized with an adherent film or coating impervious to stencil ink, which film or coating has the property of transferring in a pattern closely corresponding to a pattern impressed upon the opposite side of the stencil sheet. A stencil so "cut" will print or stencil a pattern corresponding to the transferred pattern when used in a duplicating machine or hand stencil stamp, the stencil ink passing through the impervious coating or film in the areas of pattern transfer.

Where a carbon copy book of the invention is intended for memorandum use, the top sheet may be ordinary bond and the carbon copy sheets may be onionskin paper. Such a book may consist of as many as ten carbon sheets, ten sheets of onionskin and an original impression sheet. If it is desired to use such a book as a piggyback copy book, fewer sheets would be preferable. Such books may be made ready for piggyback operation merely by removing the bottom sheet and adhering the book to the surface intended to receive a carbon copy of the impression.

While ordinary smooth bond or onionskin will act as a protective sheet for the carbon sheet and its pressure sensitive surfaces, it may be desirable, as cases where the pressure sensitive adhesive is to be transferred from the protective sheet to the carbon sheet, to use a glazed paper for the protective sheet. Such a glazed sheet may be prepared by pressing cellulose pulp sheet having a high freeness but with a low freeness contact surface against a polished drying surface. Such a sheet may also be made by coating a smooth dried cellulose pulp base sheet with an aqueous mixture including a hydrophilic colloid and drying the coated surface in contact with a polished surface. Synthetic resin-filled papers are also suitable, such as those, for instance, in which melamine monomer is incorporated and then condensed in situ with formaldehyde. Smooth papers with coatings having low adhesion to adhesives in general are suitable, several of which are compared in U.S. Patent No. 2,532,011.

Referring once more to the drawings, in FIGURE 1 the tissue sheet 12 is impregnated with a carbon-oil mixture 13 and has both sides with an adhesive margin 14. In FIGURE 2 the carbon copy book 10 consists of an original impression sheet 11, a carbon sheet 12 of the type shown in FIGURE 1 and a carbon copy or protective sheet 15. In FIGURE 3 constituting a stencil assembly 20, the components are a stencil sheet 16 having a transfer coating 17 thereon, a carbon sheet 12 and a carbon copy or protective sheet 15. In FIGURE 4 before assembly the protective sheet 15 carries a band of pressure sensitive adhesive 14 while the carbon sheet 12 has no adhesive. After assembly the adhesive is transferred from sheet 15 to sheet 12 penetrating through porous sheet 12 to make both sides pressure sensitive in the narrow area of the adhesive band.

I claim:

1. A carbon sheet suitable when placed between an original impression-receiving sheet and a copy-receiving sheet, of transferring a carbon impression to said copy-receiving sheet corresponding to an impression made on said impression-receiving sheet, comprising a porous fibrous base impregnated on one side thereof to retain its porosity with a viscous aromatic hydrocarbon oil vehicle containing finely divided carbon, said fibrous base having contact areas on both sides thereof which are an impregnation through said porous fibrous sheet of pressure sensitive adhesive.

2. A carbon copy book comprising a top impression-receiving sheet, a bottom protective sheet and a porous fibrous carbon and oil impregnated sheet between, said book being held in assembled relationship by pressure

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sensitive adhesive contact areas impregnated through said porous fibrous sheet in selected carbon and oil impregnated areas, said top and bottom sheets being peelable from said carbon sheet without removing the adhesive contact areas from said carbon sheet.

3. The carbon copy book of claim 2 wherein the impression-receiving sheet is a transfer stencil sheet and the book constitutes a stencil assembly.

4. The method of preparing a stencil assembly including a carbon-impregnated sheet, a bottom sheet and a transfer stencil sheet comprising impregnating a porous fibrous base sheet on one side thereof with finely divided carbon in a viscous hydrocarbon oil vehicle, impregnating through with pressure sensitive adhesive a

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marginal edge of said base sheet in areas impregnated with carbon and oil, making both sides of said marginal edge tacky and adhering said marginal edge to the marginal edge of a bottom sheet on one side and to the marginal edge of the transfer side of a transfer stencil sheet on the other side.

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