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54 **Single paper sheet forming a two-sided copy of information entered on both sides thereof.**

57 A single sheet of paper is divided into at least original and copy panels by fold line(s). Information entered on the two, front and back surfaces of the original panel are reproduced on the two surfaces of the copy panel by carbonless copy treatments. In one embodiment, the original panel is fully coated or partially coated with carbonless CB treatment, on both surfaces, and the copy panel is fully coated or partially coated with carbonless CF treatment. In a variation of this embodiment, the original panel is not

coated, and the copy panel is coated in selected areas with carbonless SC treatment. A booklet employing this carbonless copy sheet in strip form is disclosed. In a second embodiment, the original panel is not coated, an image-transferring panel is fully coated on both surfaces with carbonless CB treatment, and the copy panel is fully coated with carbonless CF treatment. In a variation of this embodiment, the image-transferring panel is formed of a separate sheet of paper.

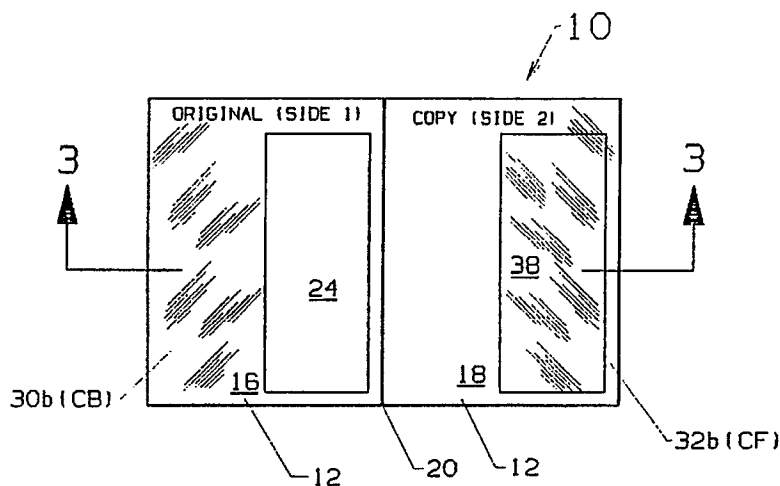


FIG 1

Technical Field of the Invention

The invention relates to carbonless copying techniques.

Background of the Invention

Carbonless copy forms are well known. A typical two-part form includes a top sheet having a coated back (CB) containing microencapsulated (generally colorless) dye, and a bottom sheet having a coated front (CF) containing a reactive dye-revealing substance. The top and bottom sheets are assembled, such as by gluing, into a "manifold", or many part set. The pressure of writing on the front surface of the top sheet causes the encapsulated dye on the CB-coated back surface of the top sheet to rupture, releasing dye onto the CF-coated front surface of the bottom sheet, whereupon the writing is revealed in a contrasting (visible) color on the front surface of the bottom sheet.

Multiple carbonless copies are produced in a similar manner. One or more intermediate sheets are assembled between the top and bottom sheets. Each intermediate sheet has a carbonless front (CF) coating on its front surface for revealing the dye from the previous sheet, and has a carbonless back (CB) coating on its back surface for releasing dye to the next sheet in the set.

With these techniques, one or more carbonless copies of information entered on the front surface of the original (top) sheet can be reproduced on a surface of the copy (intermediate and bottom) sheets.

The chemistry of the CB and CF coatings is well known, as are techniques for applying these coatings to paper stock.

A variation of the above is found in so-called "two-way write" systems. One such example is found in U.S. Patent No. 4,000,916, issued to Lucas, which describes a manifold report form having three superimposed record sheets (top, middle and bottom). Carbon sheets and protective sheets are arranged between the record sheets. Information entered on the front surface of the top record sheet is reproduced on the front surfaces of the middle and bottom sheets. The form is then flipped over, in its entirety, and various carbon and protective sheets are removed. Information entered on the back surface of the bottom sheet is reproduced on the back surface of the middle and top sheets.

With such two-way write systems, a true original is not formed. Rather, each of the top and bottom sheets contains "original" (e.g., hand written) information on only one surface, and "copy" (reproduced by carbon paper or the CB/CF dye

reaction) information on the other surface. Such a bifurcation of the original information is unsuitable in many applications, such as for legal forms.

U.S. Patent Nos. 4,715,620 and 4,762,342, issued to Thompson, attempt to solve the challenge of providing a "true" original where the top sheet has "original" information on the front and back surfaces thereof. Therein, top, intermediate and bottom sheets are assembled into a manifold having a stub. Patterned carbon papers and/or carbonless coatings are employed, between the various sheets, as in the two-way write systems. Information is entered on the front surface of the top sheet. The top sheet is then folded around the stub so that its front surface is in contact with the back surface of the bottom sheet. Additional information is then entered on the exposed back surface of the top sheet. The front surface of the top sheet is coated with carbonless CB and the back surface of the bottom sheet is coated with carbonless CF so that the information entered on the back surface of the top sheet is reproduced on the back surface of the bottom sheet.

The problems with Thompson's techniques include the following: 1) It is extremely difficult to maintain registration (alignment) of the top sheet when it is folded around the stub. Hence, it is suggested by Thompson that the stub be gently folded over along with the top sheet. This causes a gap between the top sheet and bottom sheet, which is inapposite to carbonless image forming. The top sheet, when folded over the stub in this manner, must be smoothed out prior to entering the additional information on the back surface of the top sheet. Additionally, if the stub is not folded properly, the top sheet will not be in register with the other sheets when it is flipped over for entering information on the back surface thereof. 2) The carbonless CB coating on the front surface of the top sheet is difficult to write upon. For instance, the tip of a ball point pen will tend to become clogged by dye released from the microcapsules in short order.

The implementation of all of the above-described manifold forms is further complicated by the need for machinery necessary to collate, glue and/or staple individual, dissimilarly coated sheets of paper, carbon papers and protective sheets into a manifold arrangement. This necessitates costly set up charges for the equipment, creates delays in going from paper stock to preprinted form, and creates cumbersome inventory requirements.

Disclosure of the Invention

Hence, it is an object of the present invention to provide a technique for producing carbonless

copies of information entered on both the front and back surfaces of an original sheet without the problems of writing on carbonless coatings and without the difficulties attendant to manifold arrangements, such as their dissimilar sheets and stubs.

It is a further object of the invention to provide a technique for producing carbonless copy forms with only commonplace printing equipment, in other words without additional collators, gluers, staplers and the like.

It is a further object of the invention to provide a technique for producing "blank" forms that can be readily imprinted with "fixed" information.

As used herein, "fixed" information refers to information imprinted on a form before it is filled out by a user. "Variable" information refers to information entered by the user on the form.

It is a further object of the invention to provide a technique for producing carbonless copy forms where the paper stock is readily manufacturable by the roll, and readily converted from bulk roll form into individual sheets.

According to the invention, a single sheet of paper is divided by fold lines into two or more panels (portions), one of which serves as an "original" panel for entering information on both sides thereof, another of which serves as a "copy" panel for reproducing the information entered on both the front and back surfaces of the original panel, and (in the case of three panels) one of which acts in conjunction with the copy panel to reproduce the information entered on both surfaces of the original panel.

Throughout the various embodiments described herein, the fold lines are preferably perforated to facilitate folding the various panels for filling out variable information, and for separating the various panels after they are filled out.

In a first embodiment, a single sheet of paper is divided by a fold line into two panels, an "original" panel and a "copy" panel. Folded a first way, the original and copy panels are in back-to-back relationship, and the front surface of the original panel is exposed for writing. Information entered in a first area on the front surface of the original panel is reproduced on the back surface of the copy panel. This is accomplished by applying a carbonless CB coating to an area on the back surface of the original panel directly behind the first area on the front surface of the original panel, and by applying a carbonless CF coating to an area on the back surface of the copy panel which is aligned with the CB-coated area on the back surface of the original panel when the sheet of paper is folded the first way. Folded a second way, the original and copy sheets are in front-to-front relationship, and the back surface of the original panel is exposed for writing. Information entered in a second area on

the back surface of the original panel is reproduced on the front surface of the copy panel. This is accomplished by applying a carbonless CB coating to an area on the front surface of the original panel directly opposed to the second area on the back surface of the original panel, and by applying a carbonless CF coating to an area on the front surface of the copy panel which is aligned with the CB-coated area on the front surface of the original panel when the sheet of paper is folded the second way.

In an alternate configuration of the first embodiment, the original panel has first and second specific areas on its front and back surfaces, respectively, for filling in information, but is not coated with any carbonless treatment. The areas on the back and front surfaces of the copy panel which reproduce the information entered on the original panel are treated with a carbonless SC ("self-contained" mixture of CB and CF) treatment.

In both of these "patterned" configurations where first and second areas on the front and back surfaces, respectively, of the original panel are specified for filling in information, the areas are offset, in other words non-aligned front-to-back, on the original panel.

In another alternate configuration of the first embodiment, the front and back surfaces of the original panel are substantially fully coated with carbonless CB treatment, and the front and back surfaces of the copy panel are substantially fully coated with carbonless CF treatment. Since the CB coating on the original panel may tend to clog (ball point) pens, it is preferred that an impact-type printer or typewriter be used with this configuration.

In yet another alternate configuration of the first embodiment, a three panel sheet is provided. One of the panels is the original panel, another is a first copy panel and the remaining panel is a second copy panel. Patterned coatings are employed to reproduce on each of the first and second copy panels information entered on both sides of the original panel.

In a second embodiment, a single sheet of paper is divided by two fold lines into three panels, an "original" panel, a "copy" panel and a "magic", image-transferring panel. The term "magic" panel is coined. Folded a first way, the image-transferring panel resides between the original panel and the copy panel, and information entered on one surface of the original panel is reproduced on one surface of the copy panel. This is accomplished by a CB coating on one surface of the image-transferring panel and a CF coating on the one surface of the copy panel. Folded a second way, the image-transferring panel resides between the original panel and the copy panel, and information entered on an opposite surface of the original panel is repro-

duced on an opposite surface of the copy panel. This is accomplished by a CB coating on an opposite surface of the image-transferring panel and a CF coating on the opposite surface of the copy panel.

Alternate arrangements of the original, copy and magic panels as end or middle panels of this "tri-fold" are disclosed.

In an alternate configuration of the second embodiment, the original and copy panels are formed of a single sheet, and the magic panel is formed of a separate sheet.

Other objects, features and advantages of the invention will become apparent in light of the following description thereof.

Brief Description of the Drawings

Figures 1, 2 and 3 are top plan, bottom plan and cross-sectional views, respectively, of the first embodiment of the invention.

Figures 4, 5 and 6 are top plan, bottom plan and cross-sectional views, respectively, of the second embodiment of the invention.

Generally, throughout the descriptions that follow, a sheet of paper has a front surface and a back surface and is divided (by fold lines) into panels. Each of the panels has a front surface defined by the front surface of the sheet and a back surface defined by the back surface of the sheet.

Detailed Description of the Invention

First Embodiment

Figures 1, 2 and 3 show a self-replicating form 10 comprising a single sheet of paper 11 having a front surface 12 and a back surface 14. The sheet is divided into an "original" panel 16 and a "copy" panel 18 by a fold line 20. The fold line is provided with a series of perforations for folding and separating the two panels 16, 18.

A specific area 24 on the front surface of the original panel is designated for the user filling in variable information. The remaining area of the front surface of the original panel may be utilized for providing pre-printed, fixed information on the form.

When the form 10 is folded in a first direction along the fold line 20, the original and copy panels are in back-to-back relationship, as indicated by an arrow "A". An area 28 on the back of the copy panel is thus aligned with the area 24 on the front

of the original panel. A carbonless CB treatment 30a is applied to an area on the back of the original panel in front-to-back alignment (on the original panel) with the area 24, and a carbonless CF treatment 32a is applied to the area 28 on the back of the copy panel. In this manner, variable information entered in the area 24 of the front surface of the original panel is reproduced in the area 28 on the back surface of the copy panel.

A specific area 34 on the back surface of the original panel is designated for the user filling in variable information. The remaining area on the back surface of the original panel may be utilized for providing preprinted, fixed information on the form.

When the form 10 is folded in a second, opposite direction along the fold line 20, the original and copy panels are in front-to-front relationship, as indicated by an arrow "B". An area 38 on the front of the copy panel is thus aligned with the area 34 on the back of the original panel. A carbonless CB treatment 30b is applied to an area on the front of the original panel in front-to-back alignment with the area 34, and a carbonless CF treatment 32b is applied to the area 38 on the front of the copy panel. In this manner, variable information entered in the area 34 of the back surface of the original panel is reproduced in the area 38 on the front surface of the copy panel.

Notably, the areas 24 and 34 on the front and back surfaces, respectively, of the original panel are clear (void) of any carbonless coatings, which completely avoids any problem with writing in these areas. In order to effect this goal, the areas 24 and 34 are advertently offset, i.e. not aligned front-to-back on the original panel.

Paper for the form 10 can be mass produced in a roll, by applying vertical (as shown) stripes of carbonless CB and CF coatings to the bulk paper. The roll of paper can then be cut (horizontally, as shown) into individual forms, without any need for registration or timing marks.

In use, the panels are folded one way to enter information on the front of the original panel, and are folded another way to enter information on the back of the original panel. This information is reproduced on the back and front surfaces, respectively, of the copy panel. The form is then unfolded and the panels are separated along the fold line.

In an alternate configuration of the first embodiment of the invention, no carbonless coating is applied to the original panel 16. With reference to Figures 1-3, this indicates that there is no carbonless CB coating 30a and 30b on the original panel. Reproduction of information entered in the areas 24 and 34 on the front and back surfaces, respectively, of the original panel onto areas 28 and 38, respectively, of the copy panel is accomplished by

applying a "Self-Contained" (SC) carbonless coating to the areas 28 and 38 of the copy panel. A Self-Contained (SC) carbonless coating is essentially a mixture of carbonless CB and CF coatings.

In another alternate configuration of the first embodiment of the invention, the original panel is substantially fully coated on its front and back surfaces with carbonless CB treatment, and the copy panel is substantially fully coated on its front and back surfaces with carbonless CF treatment.

Second Embodiment

Figures 4, 5 and 6 show a self-replicating form 60 comprising a single sheet of paper 61 having a front surface 62 and a back surface 64. The sheet is divided into an "original" panel 66, a "magic", image-transferring panel 67 and a "copy" panel 68 by two fold lines 70a and 70b. The fold lines are provided with a series of perforations for folding and separating the three panels 66, 67 and 68.

When the form 60 is folded in a first direction along the fold lines, the original and copy panels are in back-to-back relationship, as indicated by the arrows "C" and "D", and the "magic" panel is interposed between the original and copy panels. A carbonless CB treatment 80a is applied to substantially the entire back surface of the "magic" panel, and a carbonless CF treatment 82a is applied to substantially the entire back surface of the copy panel. In this manner, variable information entered on the front surface of the original panel is reproduced on the back surface of the copy panel.

When the form 60 is folded in a second direction along the fold lines, the original and copy panels are in front-to-front relationship, as indicated by the arrows "E" and "F", and the magic panel is interposed between the original and copy panels. A carbonless CB treatment 80b is applied to substantially the entire front surface of the magic panel, and a carbonless CF treatment 82b is applied to substantially the entire front surface of the copy panel. In this manner, variable information entered on the back surface of the original panel is reproduced on the front surface of the copy panel.

In use, the panels are folded one way to enter information on the front of the original panel, and are folded another way to enter information on the back of the original panel. This information is reproduced on the back and front surfaces, respectively, of the copy panel. The form is then unfolded, the panels are separated along the fold lines and the magic panel is discarded.

Alternate configurations of the original, copy and magic panels are within the scope of this invention. For instance, either the original or magic

panels can be the middle panel (as viewed in the Figures), and the copy panel can be an end panel. In the case of both the original and copy panels being end panels, and the magic panel being the middle panel, the form must be folded in a zig-zag manner to be interposed between the original and copy panels, and information entered on the front and back surfaces of the original panel is reproduced on the front and back surfaces, respectively, of the copy panel.

In all of these configurations of the second embodiment, the original panel is uncoated, the copy panel is substantially fully coated on both its front and back surfaces with carbonless CF treatment, and the magic panel (or separate sheet) is substantially fully coated on both its front and back surfaces with carbonless CB treatment.

In yet another configuration of this embodiment, the magic panel is provided as a separate sheet of paper to be inserted between the original and copy panels which are formed of a single sheet of paper, and the magic sheet is coated on at least one surface with CB treatment. If only one surface of the magic sheet is CB-coated, this surface must always be in contact with the CF-coated surfaces of the copy panel. Preferably, both surfaces of the magic sheet are CB-coated.

Booklet formed with the carbonless paper of this invention

Copending U.S. Patent Application No. 334,183, entitled METHOD AND APPARATUS FOR RECORDKEEPING, filed April 6, 1989 by Keith E. Schubert, discloses carbonless paper that is capable of producing a two-sided copy of a two-sided original. This is done with a single strip (sheet) of paper, divided into an original portion and a copy portion, each of which are coated with appropriate carbonless coatings, such as described above. The strip is zig-zag folded, forming a series of original "pages" and copy "pages". The endmost original pages are affixed to the inside surfaces of covers, forming a booklet.

Claims

1. A form created by a single sheet of paper, characterized by:
an original panel having a front surface and a back surface;
a copy panel having a front surface on the same side of the sheet as the front surface of the original panel and a back surface on the same side of the sheet as the back surface of the original panel; and
carbonless copy treatment applied to at least the

front and back surfaces of the copy panel;
thereby reproducing information entered on the
front and back surfaces of the original panel onto
the front and back surfaces of the copy panel.

2. A form, according to claim 1, characterized 5
in that:

information entered on the front and back surfaces
of the original panel is reproduced on the back and
front surfaces, respectively, of the copy panel.

3. A form, according to claim 1, characterized 10
by:

carbonless copy treatment applied to the front and
back surfaces of the original panel.

4. A form, according to claim 3, characterized 15
in that:

the carbonless copy treatment is applied only to
specific areas of the original panel; and
information is entered on the front and back sur-
faces of the original panel only in non-coated areas
of the original panel. 20

5. A form, according to claim 1, characterized
in that:

carbonless copy treatment is applied only to the
copy panel.

6. A form, according to claim 1, characterized 25
by:

a third panel having a front surface on the same
side of the sheet as the front surfaces of the
original and copy panels and a back surface on the
same side of the sheet as the back surfaces of the 30
original and copy panels: and
carbonless copy treatment applied to the front and
back surfaces of the third panel.

7. A form, according to claim 1, characterized 35
by:

three panels, an original panel clear of carbonless
coating, a copy panel having a carbonless coating,
and a transfer panel having a carbonless coating
for reproducing on the copy panel information en-
tered on the original panel. 40

8. A form, according to claim 1, characterized
by:

two panels, an original panel clear of carbonless
coating and a copy panel having a carbonless
coating; and 45
a separate transfer panel having a carbonless coat-
ing for reproducing on the copy panel information
entered on the original panel.

9. A form, according to claim 1, characterized 50
in that:

the sheet of paper is in the form of a zig-zag strip
with zig-zag folds oriented transversely across a
fold dividing the original panel from the copy panel,
thereby forming a plurality of original panels and a
plurality of copy panels; and 55

further characterized by:
covers attached to the endmost original panels.

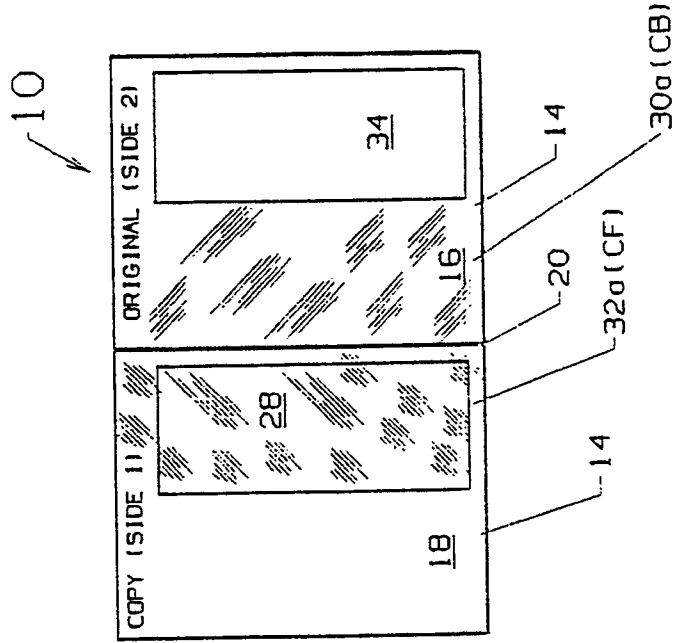


FIG 1

FIG 2

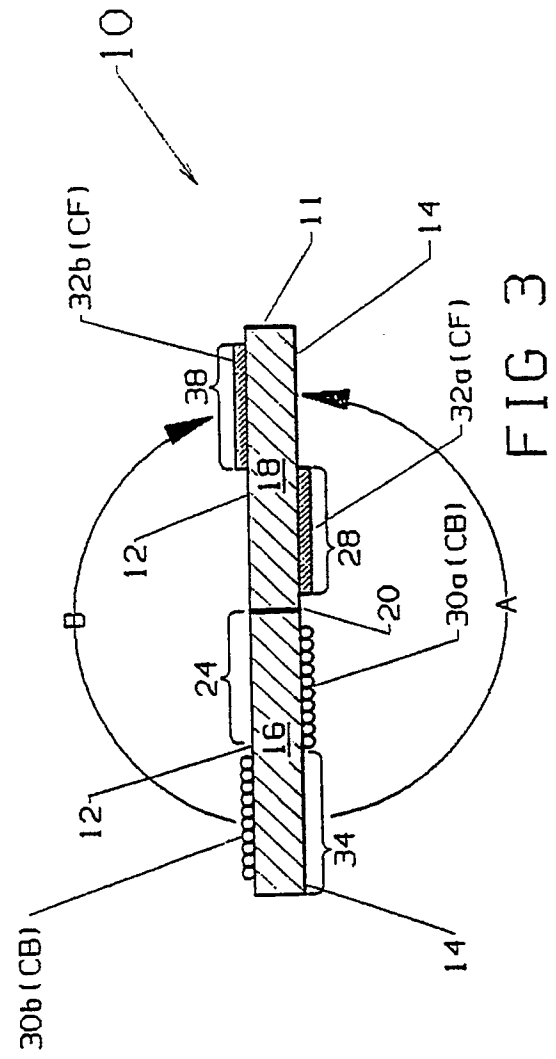


FIG 3

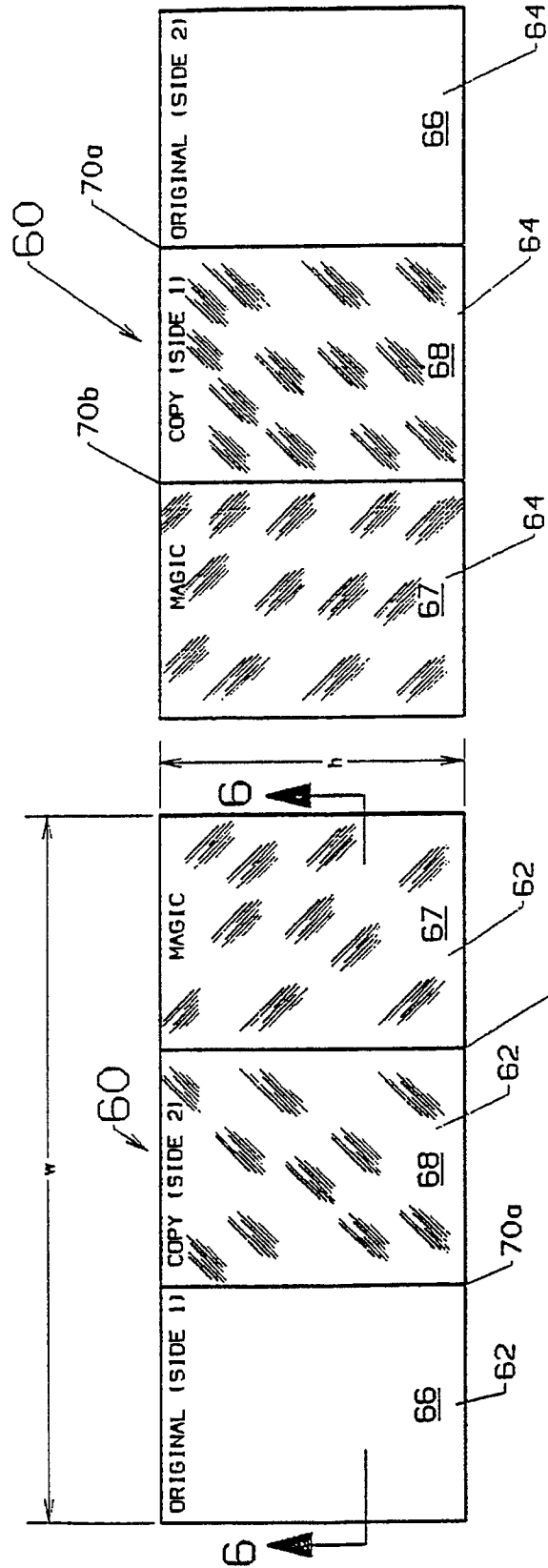


FIG 5

FIG 4

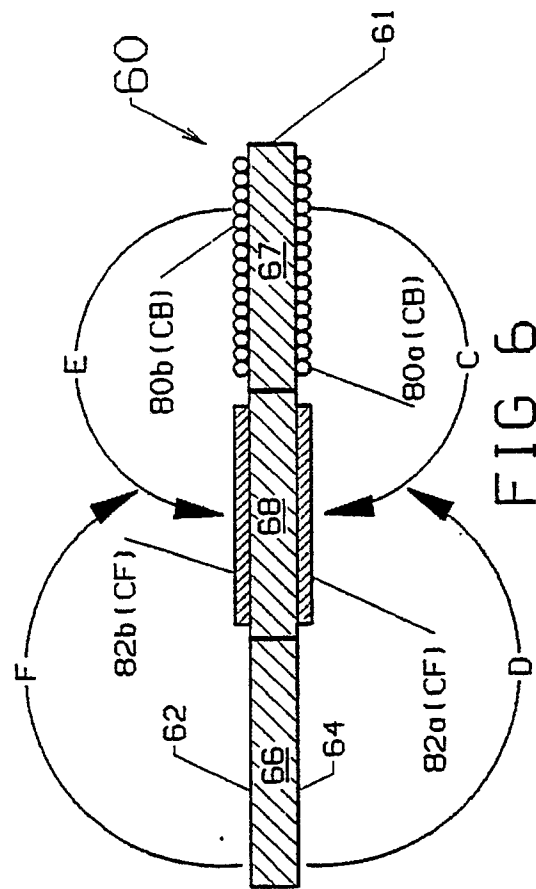


FIG 6