April 11, 1933. R. M. WENDEL 1,903,711

MANUFACTURE OF DUPLEX OR MULTIPLEX PAPER WITH DIFFERENT APPEARANCE ON VARIOUS SPOTS

Filed May 14, 1931 2 Sheets-Sheet 1

Fig. 1.

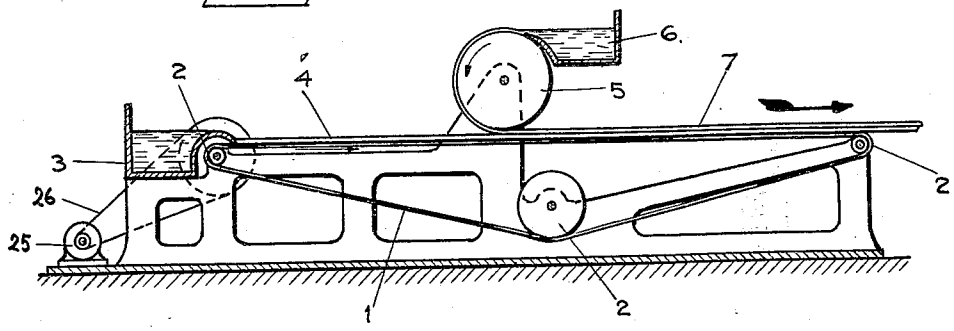


Fig. 2.

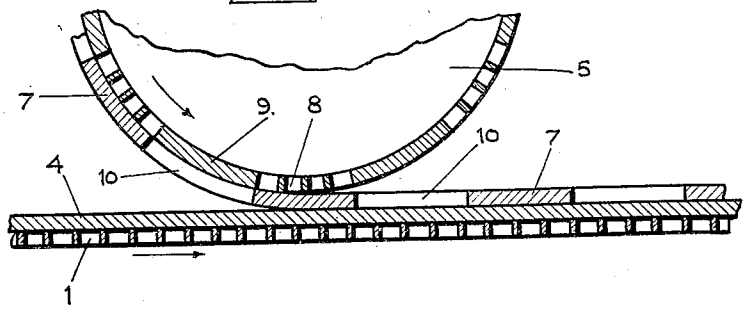


Fig. 4.

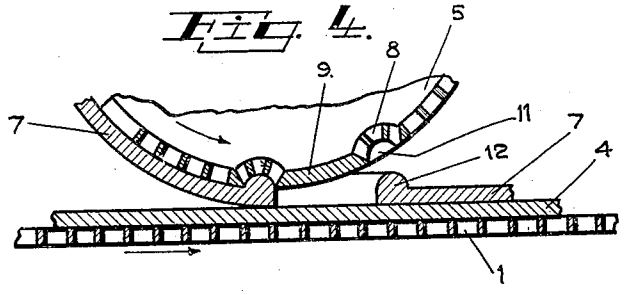
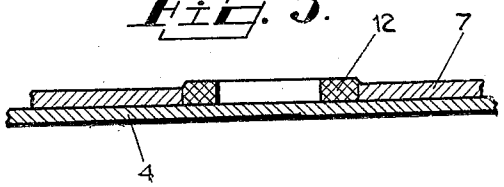


Fig. 5.



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Fig. 6.

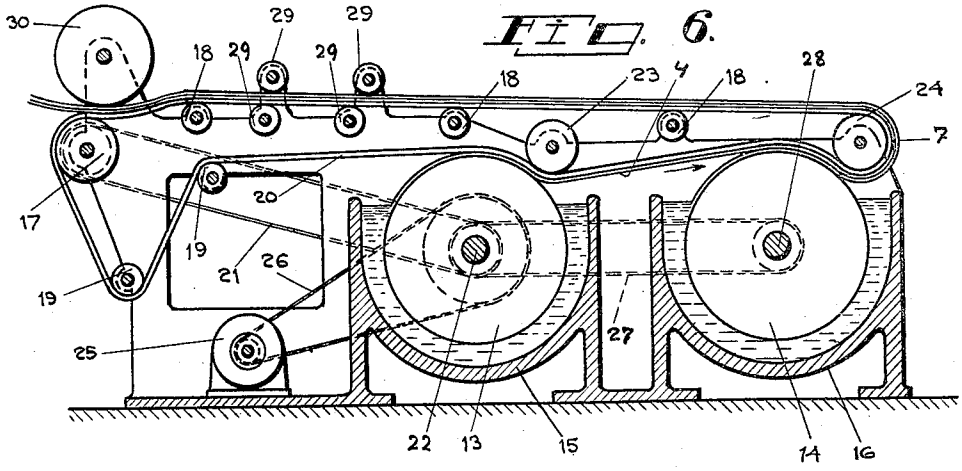


Fig. 3.

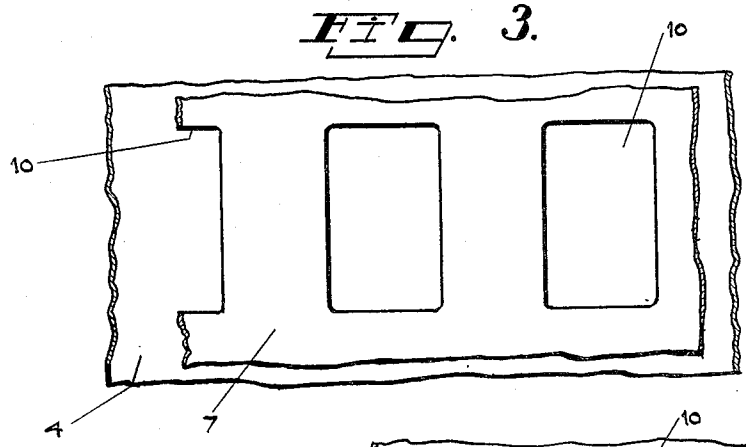
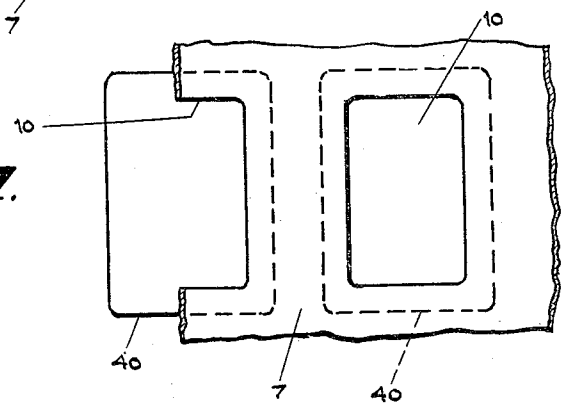


Fig. 7.



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UNITED STATES PATENT OFFICE

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MANUFACTURE OF DUPLEX OR MULTIPLEX PAPER WITH DIFFERENT APPEARANCE ON VARIOUS SPOTS

Application filed May 14, 1931, Serial No. 537,447, and in Sweden April 21, 1931.

This invention refers to the manufacture of paper and more specifically to the manufacture of papers consisting in two or more thicknesses. The main object of this invention is to produce a duplex or a multiplex paper in which certain spots have an appearance or quality different from other portions of the surfaces of the paper web.

Such variations in the surface of the paper can be due to the degree of transparency of the paper or to the colour thereof or to other qualities of the surface. Especially when making envelopes for letters it is known to provide some part of the front of the envelope of transparent material so as to render visible the address written on the letter proper in order to save the time of writing a special address on the envelope.

In other cases it is usual to provide the coloured cover of a writing or sketch book or such like with a white label for use in writing in the name of the owner or for other notices.

In the first mentioned case it is usual to treat the paper of the envelope at the desired place with some suitable means to give said spot the requisite transparency and in the other case one attaches the white label to the surface of the coloured cover. Thus both these procedures require special operations which usually are undertaken after the paper article has been made, and accordingly will involve considerable trouble and expense.

In accordance with the present invention the paper is made in two or more layers when manufactured on the paper making machines, whereby openings or windows are made in one layer of the paper web at such places where some special appearance is to be given the objects manufactured later on from said paper, while the other layer of the paper web is so manufactured as to possess the quality which is desired and is visible in the windows in the first mentioned layer.

One object of this invention, accordingly, will be to reduce the costs of manufacture of envelopes or such like by obviating expensive secondary operations and manufacturing in one operation the paper web possessing the desired qualities.

In the accompanying drawings there are illustrated some embodiments of a machine constructed and operated in accordance with the invention, but I do not limit myself to these embodiments of the machine only as the importance of this invention lies in the manufacture proper and not in the specific means to carry out the manufacture, which means can be varied in several respects without departing from the principles of my invention. Thus the drawings have for their sole object to assist in the explanation of the invention.

Figure 1 is a side elevation view partly in section of one embodiment of the "wet" portion of a paper making machine arranged to carry out this invention.

Figure 2 shows on an enlarged scale a cross section through a portion of the wire of the paper making machine and a rotary sieve cooperating therewith.

Figure 3 is a plan view of a portion of a paper web manufactured in accordance with this invention.

Figure 4 is a cross section similar to that in Figure 2 but showing a somewhat modified construction.

Figure 5 illustrates a portion of the parts in Figure 4 in a somewhat later moment of operation.

Figure 6 is a sectional view of another embodiment of the paper making machine, and

Figure 7 is a plan view similar to Figure 3 but showing a further embodiment in the manufacture.

In the following the new process will be explained by a description of the machines by means of which the process is carried out, whereby I will describe first the embodiments shown in Figures 1 to 5, assuming that the paper which is to be manufactured comprises two layers, the one of which is substantially opaque but provided with some openings or windows, and the other layer transparent and arranged to appear in said openings as transparent covers therein, so that the combined or duplex paper can be used for the manufacture of "window"-envelopes.

In Figures 1, 2 and 4 the paper making machine is provided with a wire 1 running over breast and guide rolls 2, one of which is driven by means of a belt 26 from an electric motor 25. From the flow box 3 the stock is spread out on the wire 1 which moves in direction of the straight arrow in Figure 1, whereby the stock will form the one layer 4 of the paper web. In the present example said layer 4 is of a transparent character.

At some distance apart from the flow box 3 another flow box 6 is suspended at a certain height above the wire 1, and in front of said flow box a drum like sieve 5 rotates in the direction of the arrow shown thereupon. The rotary sieve 5 collects paper stock from the flow box 6 and supplies the same in a layer 7 above the layer 4 on the wire 1, where the two layers 4 and 7 are joined together by the intermingling effects of their wet fibres. From the wire 1 the duplex paper web 4—7 passes over to the "dry" portion of the machine which is not shown in the drawings, because it does not relate to this invention and can be designed and operated as is the case in every known paper making machine. From the "dry" portion of the machine the duplex paper web will be taken off ready for use.

In accordance with the present invention the wire 8 of the rotary sieve 5 is made solid at certain spots 9 for instance by filling up the interstices of the metal wire net with a solder or by the application of thin metal strips outside the drumlike sieve. On such solid portions no water can penetrate the sieve, and as a consequence no suction action will occur with the result that the wet stock cannot adhere and thus a hole will be left in the web. If the solid portions 9 are made of a requisite size and displaced on the cylindrical surface of the rotary sieve 5 at proper intervals, the layer 7 of the paper web will be provided with series of openings 10 corresponding to the windows in the envelopes which afterwards will be cut out from that paper web.

In Figures 2 and 3 said windows 10 are shown of a larger size and disposed closer together than suitable for actual manufacture of "window" envelopes, but that is done exclusively to save space in the drawings, and to more clearly illustrate the invention. As mentioned above, the layer 4 is transparent, and the result will be a transparent cover in the windows or openings 10 replacing the transparent spots in the former types of window envelopes, the paper of which latter had to be subjected to special operations to render it transparent.

In Figure 4 a modified embodiment of the rotary sieve 5 is illustrated. The solid portions 9 of the sieve 8 are surrounded each by channel like cavities 11 made in the perforate portion of the sieve 8. By these channels a rib 12 will be formed in the layer 7 around each opening 10 when the said layer is applied to the layer 4 on the wire 1. When the paper web afterwards passes between the press rolls (not shown) of the paper making machine, said ribs 12 will be compressed as diagrammatically shown in Figure 5, which will give these portions the appearance of a frame having a darker colour than the other portions of the paper web. In Figure 5 the compressed rib 12 forming the frame is represented by crossed section lines for the purpose of indicating the said darker colour.

In the embodiment shown in Figure 6 the "wet" portion of the paper making machine comprises substantially two rotary sieves 13 and 14 with horizontal shafts and submerged inflow boxes 15 and 16, respectively, so that a small portion only of the sieve projects above the level of the liquid in said boxes. A felt 20 driven on rolls 18, 19 by a guide roll 17 moves in the direction of the arrow, whereby the felt touches the top portion of the rotary sieves pressed thereagainst by breast rolls 23 and 24 respectively. The guide roll 17 is driven from the shaft 22 of the rotary sieve 13 by a belt or chain 21 and the shaft 22 is driven from an electric motor 25 by a belt or chain 26. The shaft 28 of the rotary sieve 14 is driven from shaft 22 by a chain 27. Having passed the two rotary sieves the felt 20 is conducted between press rolls 29, 30, from which the paper web goes over to the "dry" portion of the paper making machine, the dry portion not being shown.

One of the sieves is made solid at certain spots similarly to the rotary sieve 5, so that said solid portions cannot catch the stock from the associated flow box and supply it on the felt 20. The other portions of said sieve as well as the entire sieve surfaces of the other rotary sieve catch the stock in their flow boxes 15, 16 and supply it on the underside of the felt 20 so that the stock from the first sieve 13 forms the one layer 4 and the stock from the other sieve 14 forms the other layer 7.

It is arbitrary which one of the rotary sieves, 13 or 14, produces the layer with the openings 10. In accordance with the above described procedure the openings 10 are formed in the layer 7, therefore it will be the sieve 14 which is provided with solid portions.

When producing both the layers 4 and 7 as continuous webs there is no need of synchronizing the movements of the two sieves 13, 14 as a displacement between the two layers will have no injurious effect. Hence it is not necessary to use a chain for the drive 27 between the sieves but a belt can be substituted therefor.

However, this invention comprehends a modified embodiment of the new process

which will result in a considerable saving of material. It is, of course, not necessary to supply the layer 4 over the entire area of layer 7, because only those portions of layer 4 which are visible through the openings 10 in layer 7 have any real function. In a usual "window" envelope the window occupies only approximately 10 per cent of the entire paper whereof the envelope consists, and accordingly the remaining 90 per cent of the layer 4 will be useless. Hence it is a matter of considerable saving of material, if the layer 4 is reduced in size to only small labels or inserts corresponding to the openings 10 in layer 7. Figure 7 exemplifies such an embodiment of a duplex paper where the transparent paper layer 4 is replaced by labels or inserts 40 of a size only so much larger than the windows 10 in layer 7 that a sufficient border portion is left around to ensure safe attachment between the two layers.

The method of manufacture will be quite the same as described in connection with Figure 6 with the only exception that both the rotary sieves 13 and 14 must have solid portions, that is the one sieve just as described above to form the openings 10 in layer 7, while the other sieve must have those portions solid which correspond to the spaces between the labels 40. When making paper for "window" envelopes, the sieve for the transparent layer or labels 40 will thus have only approximately 10 per cent of its surface perforate and the remaining portion solid, while the other sieve will have only the 10 per cent of its surface solid to form the openings 10 and the remaining portion perforate.

In this case it is essential that the sieves revolve in synchronism, because otherwise the labels 40 will not accurately register with the openings 10.

It is easy to understand that there will be no material divergence either in the machine or in the process proper, if more than two layers 4 and 7 are to be produced, the only variation will be a multiplication of the number of rotary sieves, one for each layer. Also the process can be utilized in the manufacture of duplex or multiplex paper where the one layer has a different color from the other layer.

What I claim is:

1. A method of making paper having transparent portions, consisting in forming a layer of transparent paper stock, forming a second layer of non-transparent paper stock, applying one layer upon the other layer and felting the two layers together to form a compound paper web, and finishing said paper web.

2. A method of making paper having transparent portions, consisting in forming a layer of transparent paper stock, forming a second layer of non-transparent paper stock, the second layer being provided, during its formation, with openings, applying one layer upon the other layer and felting the two layers together to form a compound paper web, finishing said paper web, cutting said compound paper web into blanks each including transparent and non-transparent portions, and forming said blanks into envelopes.

3. A method of making paper having transparent portions, consisting in forming a layer with openings therein from one paper stock, forming paper strips from a second paper stock, bringing the paper strips into registration with the openings in the paper layer and felting the superimposed portions of the two paper stocks together.

4. A method of making paper having transparent portions, consisting in forming a layer with openings therein from one paper stock, forming paper strips from a second paper stock, said strips being of greater size than the openings in the paper layer, bringing the paper strips into registration with the openings in the paper layer and felting the superimposed portions of the two paper stocks together.

5. A method of making paper having transparent portions, consisting in forming a layer with openings therein from one paper stock, forming paper strips from a second paper stock, said paper strips being of substantially the same shape as the openings in said layer but of greater size than the latter, bringing the paper strips into registration with the openings in the paper layer and felting the superimposed portions of the two paper stocks together.

6. In an apparatus for making compound paper webs, a movable carrier for the paper web, movable members having perforate and solid portions adapted to receive paper stock on the perforate portions thereof, one of said members being arranged to deposit the paper stock on said carrier and the other member being arranged to deposit paper stock upon the first deposited paper stock, means for moving the members in synchronism and separate sources of supply of paper stock for the respective members, the solid and perforate portions of one of said members being arranged to form a layer with openings of one paper stock and the perforations and solid portions of the other member being arranged to apply strips of the other paper stock in registration with the openings in said layer.

In testimony whereof I have affixed my signature.

REINHOLD M. WENDEL.