

April 11, 1939.

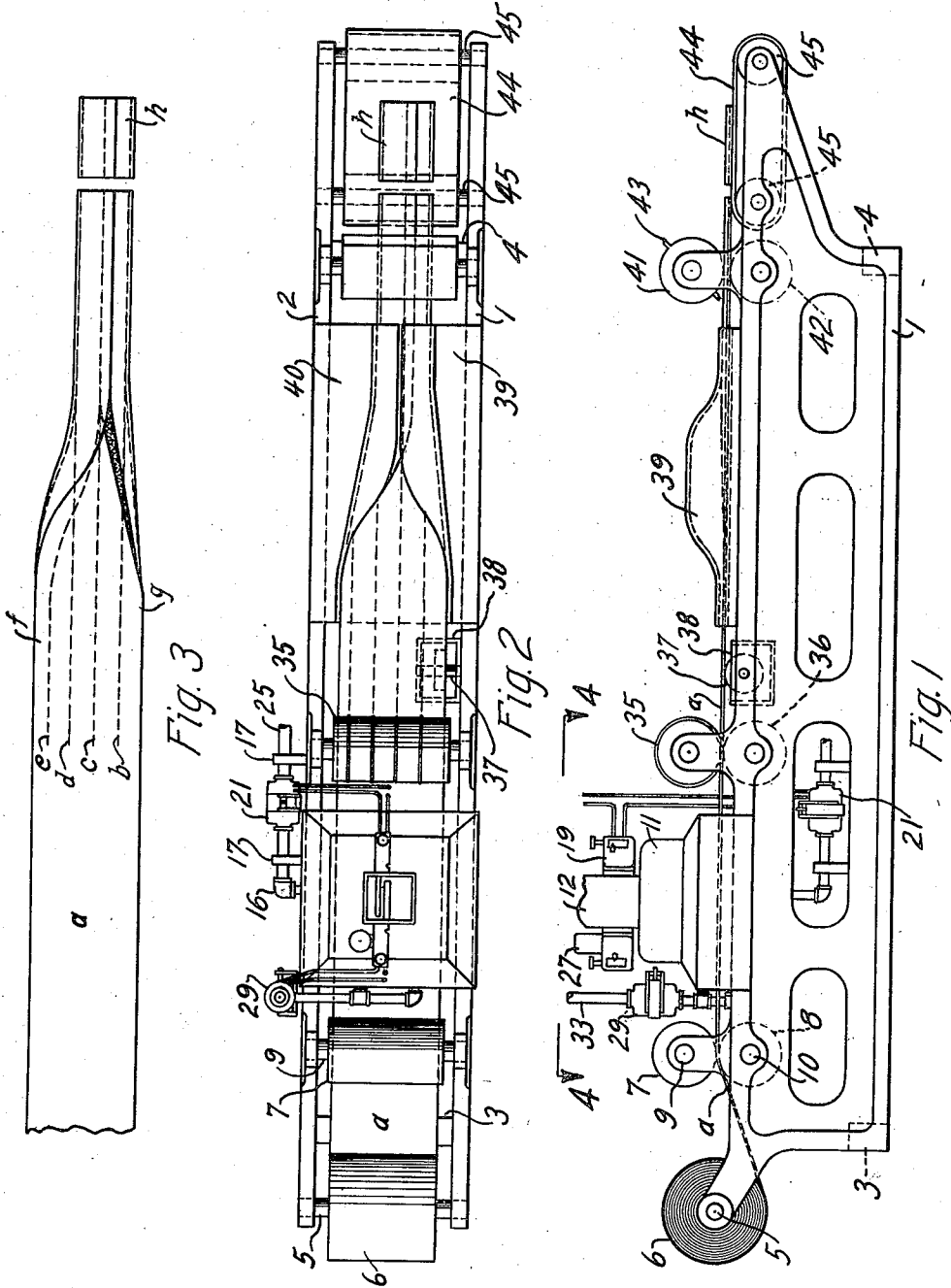
H. M. RUSSELL ET AL

2,153,846

MANUFACTURE OF PRINTED PAPER PRODUCTS

Filed Sept. 2, 1936

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

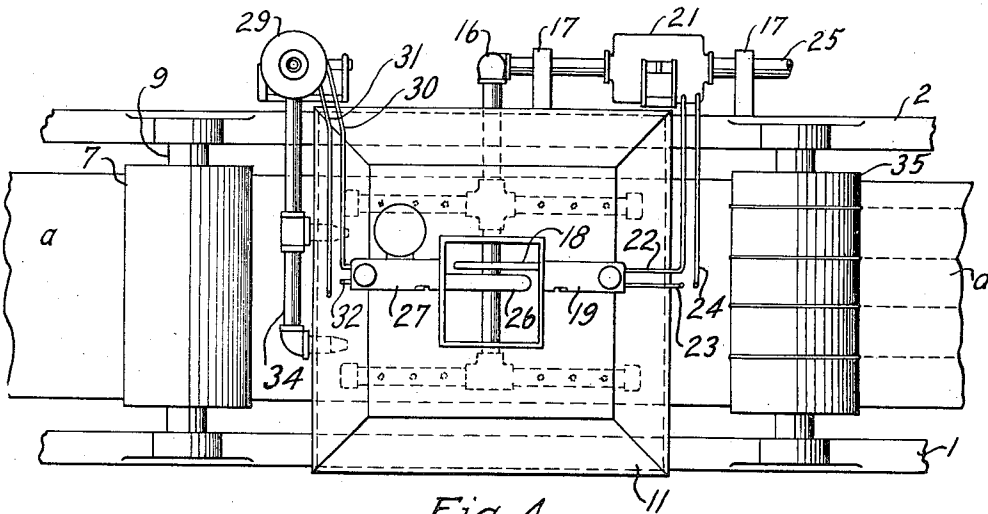


Fig. 4

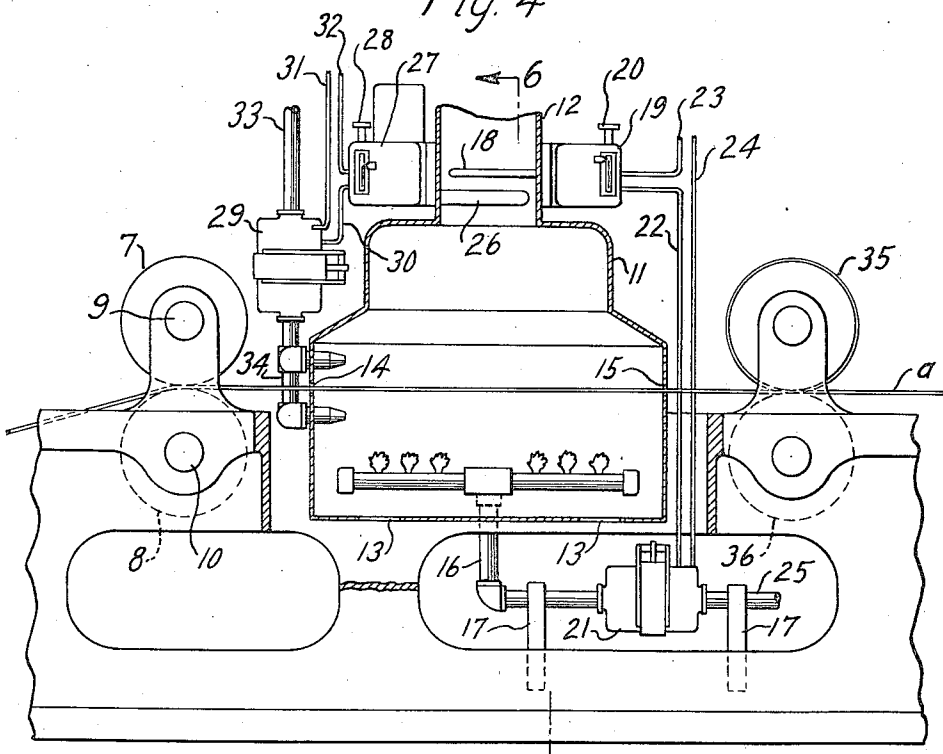


Fig. 5

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3 Sheets-Sheet 3

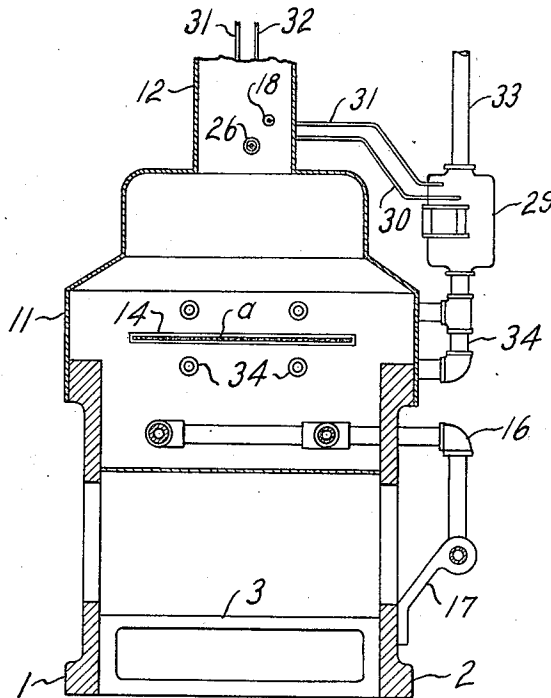


Fig. 6

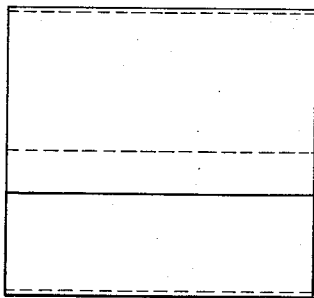


Fig. 7



Fig. 8

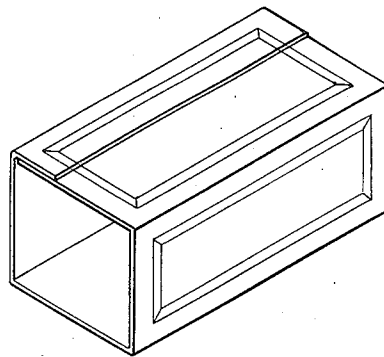


Fig. 9

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UNITED STATES PATENT OFFICE

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MANUFACTURE OF PRINTED PAPER PRODUCTS

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Application September 2, 1936, Serial No. 99,088

6 Claims. (Cl. 93—48)

The invention relates to the manufacture by automatic machinery of paper articles such as boxes, envelopes, wrappers, labels and all paper and cardboard products which are color printed and the printing ink rapidly set or fixed immediately prior to manufacturing operations.

This invention relates particularly to the art of high speed, large quantity production of printed paper articles. It is the practice of producers of such articles to use paper or cardboard which has been manufactured according to specification. A usual requirement of such specification is a prescribed amount of moisture which the material must contain. The reason for prescribing a definite moisture content of the paper is that such a requirement facilitates accurate, efficient and fine quality production by permitting the paper to respond properly to printing and fabricating operations. Should the moisture content of the paper be too low, the paper may tend to resist the printing impression, also an insufficient moisture content may result in cracking or breaking of the paper when creasing and folding operations are performed. On the other hand, should the moisture content of the paper be too high, accurate fabrication is rendered very difficult and results in a product which is likely to shrink and become distorted when exposed to atmospheric conditions which are not artificially controlled. The moisture content of the paper is frequently maintained during the period after its manufacture and up until the time for printing and fabricating, by storing the paper in chambers wherein the temperature and the humidity are controlled to prevent addition or reduction of the moisture content of the paper.

In the process of manufacturing printed fabricated articles by a succession of operations, wherein the fabricating operations follow the printing operation and wherein the printing ink must be set or fixed prior to said fabricating operations, it is necessary to apply heat to set the printed ink. Heretofore in the methods of heat setting or fixing the printed ink, the moisture content of the paper has been greatly disturbed, resulting in shrinking of the paper; thus causing faulty register of the printed areas with the fabricating operations and also rendering folding and creasing operations unsatisfactory because of cracking or breaking of the paper due to its dry condition after the heat drying treatments.

It has not heretofore been possible to produce printed and fabricated articles by a sequence of operations, wherein the printed ink is rapidly set by heat treatment, and yet maintain the mois-

ture content of the paper unchanged throughout the process of manufacture.

The process and the machine hereinafter described involves the use of quick setting printing ink containing a carrying agent which is driven off when the ink is subjected to air having a temperature upward of 180 degrees Fahrenheit. Printing inks of this character become set or condensed when subjected to air of a fairly high temperature, even though the humidity of said air be very high.

One of the objects of our invention is to produce a method by which printed paper articles may be made from a web by a succession of operations wherein color printing is effected and the printing ink rapidly set by the application of heat, without changing the moisture content of the web of paper throughout the process of manufacture.

Another object is to provide a mechanism which will automatically print a web of paper, rapidly set the printing ink by heating means without disturbing the moisture content of the paper and then fabricate the said web.

With said objects in view, and others hereinafter explained, our invention consists in the method and machine, substantially as hereinafter described and claimed.

Figure 1 is a side elevation of the essential parts of the machine for carrying out our improved method.

Figure 2 is a plan view of the machine shown in Figure 1.

Figure 3 shows the condition of a section of the paper web as it is operated upon in its passage through the machine.

Figure 4 is an enlarged plan view at 4—4 of Figure 1.

Figure 5 is an elevation of that part of the machine illustrated in Figure 4, with a part of oven 11 and side frame 1 broken away.

Figure 6 is a section at 6—6 of Figure 5.

Figure 7 is an enlarged view of the completed container *h* in flat condition.

Figure 8 is an end view of the container shown in Figure 7.

Figure 9 is a perspective view of the printed paper container after it has been opened up for use.

Similar reference characters indicate similar parts or features in all of the views.

Referring first to Figures 1 and 2, the different parts or members of the machine are mounted on suitable side frames 1 and 2 connected by crossbars 3 and 4.

Mounted on shaft 5 at the feed end of the machine is a roll of paper 6 for supplying the web *a* which is drawn continuously through the machine by the action of other parts of the machine to be described presently.

A printing unit is provided for color printing the web *a* as it is advanced, comprising printing rolls 7 and 8 mounted on shafts 9 and 10 respectively, said shafts being journaled in side frames 1 and 2.

The next unit comprises an oven 11 (Figs. 1, 2, 4, 5, and 6) supported by side frames 1 and 2. The oven is provided with a vent pipe 12, and air intake openings 13. Openings 14 and 15 are provided to permit passage of the web through said oven. A combustible gas burner 16 supported by brackets 17 mounted on side frames 2 is provided to heat the oven to a desired temperature.

The dry bulb thermometer 18 (Figs. 4, 5 and 6) mounted within vent pipe 12 automatically causes the controller 19 to operate. The said controller is provided with an adjustment screw 20 which is set to cause the controller to operate when the temperature of the oven varies from the degree of temperature at which the oven is to be maintained. The said controller 19 is electrically connected to modulating valve unit 21 and to an outside source of electric power by means of wires 22, 23 and 24. Combustible gas is supplied from an outside source to supply pipe 25, thence said gas passes through modulating valve unit 21 to gas burner 16. A wet bulb thermometer 26 is also mounted within vent pipe 12. The said wet bulb thermometer 26 automatically causes the controller 27 to operate when the wet bulb temperature within said vent pipe varies from a predetermined wet bulb temperature. Adjustment screw 28 is used to set the degree of the wet bulb temperature at which the said controller 27 shall operate. The said controller 27 is electrically connected to modulating valve unit 29 and to an outside source of electric power by means of wires 30, 31 and 32. Steam is supplied from an outside source to supply pipe 33, thence the steam passes through modulating valve unit 29 to steam jets 34.

The next unit comprises a pair of rolls 35 and 36 (Figs. 1 and 2) journaled in side frames 1 and 2, said rolls having peripheral ribs and grooves for adding crease lines *b*, *c*, *d*, and *e* (Figs. 2 and 3) to the web *a* of the paper as it is advanced through the machine.

Adhesive is applied to the margin *g* (Fig. 3) of the web *a* by roll 37 (Figs. 1 and 2) supported by reservoir housing 38 mounted on side frame 1.

The next unit comprises folding bars 39 and 40 supported by side frames 1 and 2 respectively.

The next unit comprises a pair of rolls 41 and 42 (Figs. 1 and 2) journaled in side frames 1 and 2. The upper roll 41 is provided with knives 43, which cut the folded web into sections *h* (Figs. 2, 3, and 7) as the web is advanced. From the rolls 41 and 42 the cut off sections *h* of the web pass to delivery belt 44 driven by rolls 45 journaled in side frames 1 and 2.

The controllers 19 and 27 and the modulating valve units 21 and 29 may be of any suitable construction of which there are several well known types.

It will be readily understood, without need of illustration, that any suitable motor may be employed for operating the machine, and that suitable gearing is employed in practice to cause the various rolls to rotate at uniform peripheral speed to effect the travel of the web through the

machine, in order that the operations of the several units thereof will be effected in the sequence described.

In the operation of the machine the web of paper *a* is drawn from the supply roll 6 and passes between cylinders 7 and 8 which effect color printing on the said web. The traveling web then passes into oven 11 for the purpose of applying that to the web *a* to rapidly set the printing ink thereon.

In the operation of the said oven, controller 19 is adjusted, by means of screw 20, to operate when the temperature of dry bulb thermometer 18 varies from the predetermined temperature required to set the printing ink. When the temperature registered by the dry bulb thermometer rises above the predetermined degree, the controller 19 is automatically connected by electric devices with a motor in modulating valve unit 21. Said motor then operating the modulating valve to diminish the flow of combustible gas to the burner 16, thus reducing the heat and lowering the temperature in the oven. Conversely, when the temperature registered by the dry bulb thermometer falls below the required degree, the controller 19 is automatically connected, by electric devices, with motor in modulating valve unit 21. The said motor operating the modulating valve to raise the flow of combustible gas to the burner 16, thus increasing the heat and raising the temperature in the oven. The oven 11 is provided with devices which maintain a predetermined amount of moisture in the air within the said oven. Controller 27 is provided with an adjustment screw 28 with which the controller 27 and the modulating valve unit 29 are regulated to maintain the desired wet bulb temperature within the said oven 11.

The object of introducing moisture into the oven is to maintain a relative humidity of the air within the oven to substantially equal the relative humidity of the air to which the paper was previously subjected. In other words, moisture is added to the heated air within the oven to prevent shrinking of the paper while the printed ink thereon is being set by heat treatment.

The moisture controlling devices operate in the following described manner: When the temperature registered by the wet bulb 26 rises above the predetermined degree, the controller unit 27 is automatically connected by electric devices, with a motor in modulating valve unit 29. The said motor operating the modulating valve to increase the flow of steam or moisture to steam jets 34, thus lowering the wet bulb temperature of the air in oven 11. On the other hand, when the wet bulb temperature registered by the said wet bulb thermometer 26 falls below the predetermined degree, the controller unit automatically connects, by electric devices, with a motor in modulating valve unit 29. Said motor operating the modulating valve to diminish the flow of steam to the steam jets 34, thus permitting the wet bulb temperature to be increased. From the setting oven the printed web of paper *a* is advanced to pass between rolls 35 and 36 which serve to crease the web on lines *b*, *c*, *d* and *e*.

Adhesive is applied to the margin of the traveling web by contact with adhesive applying roll 37. The web *a* is then drawn between folding bars 39 and 40 which fold the web on crease lines *b* and *d* (Fig. 3). The margin *f* of the web being folded to overlie the adhesively treated margin *g*, thus a flat, folded, tubular section is formed. The flat folded web is then advanced between

rolls 41 and 42 which cut the folded web into sections to complete the production of the printed paper articles. The completed articles then pass to delivery belt 46 from which the containers are picked up for use.

Though the invention includes the combined instrumentalities above mentioned, we wish it to be understood that we consider the means not only combinatively novel, but insofar as we are aware, certain of the devices going to make up such means are new in less combinations than the whole, as will more clearly appear hereinafter.

While we have shown a preferred method and machine for accomplishing the desired results, it is evident to those skilled in the art that changes may be made to suit the requirements of the article to be produced without departing from the spirit of our invention.

Having now described our invention, what we claim is:

1. The method of making printed paper products, consisting of printing a web of paper, advancing the printed web to an ink setting oven, raising the temperature in the oven to a degree sufficient to rapidly set the printing while maintaining the relative humidity in the setting oven to equal the relative humidity of the air outside the setting oven, and folding the web.

2. A machine for making printed paper articles, comprising a frame, means to cause a paper web to travel, printing means, an ink setting oven, means to provide a relative humidity of the air within said oven to equal the relative humidity of the air at the point where the printing operation takes place.

3. A machine for making printed paper articles, comprising a frame, means to cause a paper web to travel, printing means, an ink setting oven, means to provide a relative humidity of the air within said oven to equal the relative humidity of the air at the point where the printing operation takes place, and devices for folding the said web.

4. In a machine for making complete printed paper articles by a sequence of operations, a printing unit, an ink setting oven, a folding device, and means to maintain the relative humidity of the air within the said oven to equal the relative humidity of the air at the stations where the printing and folding operations are performed.

5. The method of making printed paper products, consisting of printing a web of paper, advancing the printed web to an ink setting oven, raising the temperature in the oven above that of the air outside of the setting oven while maintaining the relative humidity of the air inside and outside of the oven substantially uniform.

6. A machine for making printed paper articles, comprising a frame, means to cause a paper web to travel, printing means, an ink setting oven, means to raise the temperature of the air in the oven above that of the air at the point where the printing operation takes place, and a moisture controlling device for maintaining the relative humidity of the air inside and outside of the oven substantially uniform.

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