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MACHINE FOR FINISHING PAPER

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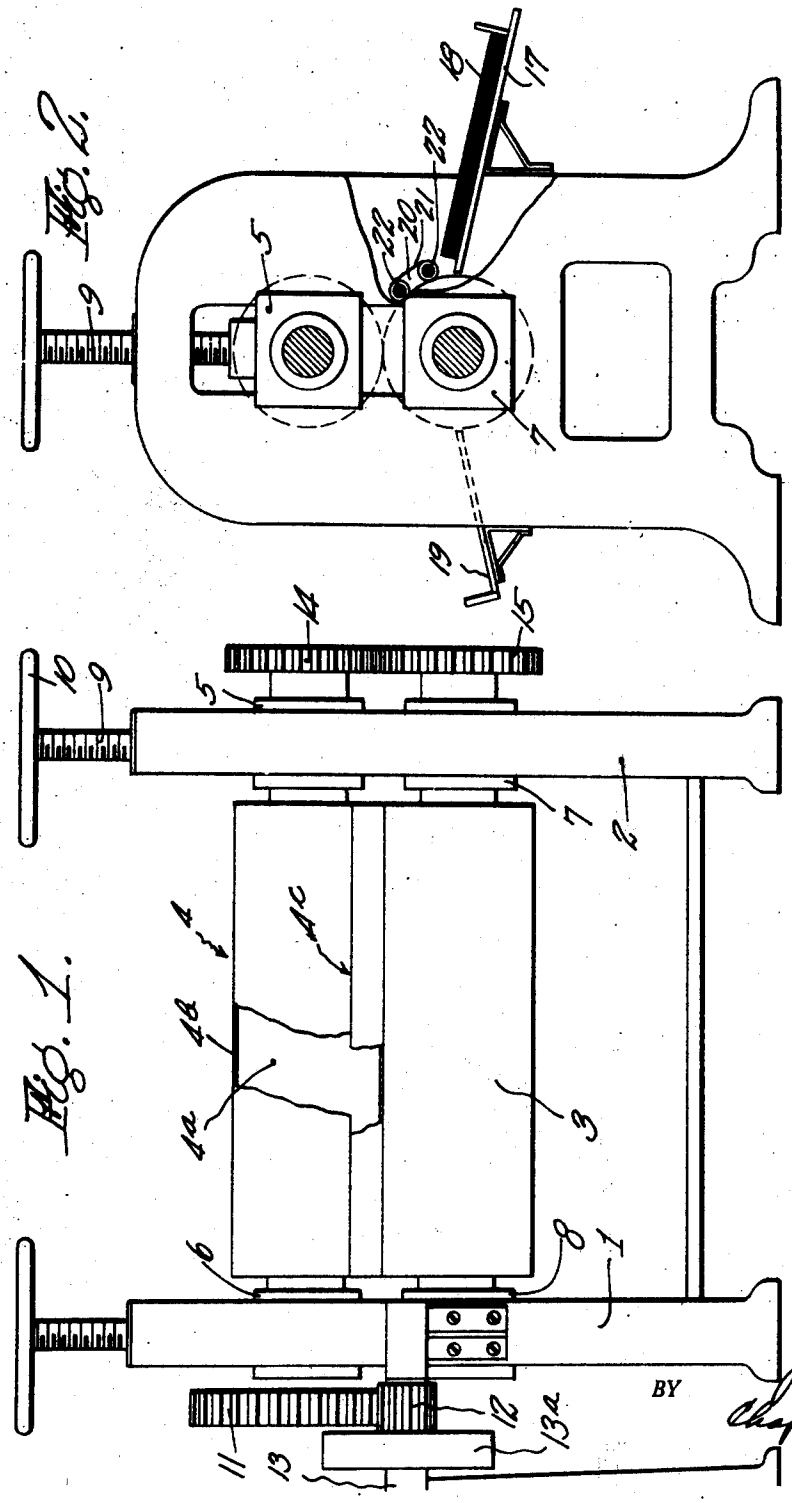


Fig. 1.

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MACHINE FOR FINISHING PAPER.

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This invention relates to an improved means for finishing the surface of paper which partakes of some of the features of both the plating and embossing methods of finishing paper although, as will be shown, it discloses many advantages over either of said former processes.

In its general aspect, the aim of the invention is the provision of means for imparting a large variety of fancy finishes to any of the usual papers upon which such a finish is desirable from the thin tissue used as a liner for envelopes to heavy card board for display purposes and including fancy writing papers, greeting cards, photograph mounts, wall papers and the like.

Heretofore, such fancy finishes of the character under consideration have been imparted by the plating method or modifications thereof, and by embossing machines. By the plating method, the paper to be finished is laid between imprint members or markers (in the case of a linen finish sheets of linen would be used as such markers) and a pile of such associated sheets of paper and markers, with sheets of metal such as zinc interspersed at intervals and on the top and bottom of the pile, is made up into what is known as a form or book. This form is passed one or more times between rollers of a suitable machine for exerting a heavy pressure thereon and thereby transfers an impression from the markers upon the adjacent surfaces of the paper sheets. As may be desired, one or both sides of a sheet of paper may be finished in this manner and the character of the finish may be as varied as the markers employed.

The plating method gives a character of finish demanded for certain grades of writing papers. This finish differs from that imparted by steel embossing rolls in that the impression is less sharply cut and therefore softer.

In embossing, the hard cut impression from an engraved metal roll upon one side of a sheet of paper is necessarily the reverse of what appears upon the other side of the sheet due to the fact that the material of the paper is actually displaced or offset in the form of the pattern. Because of the unyielding character of the imprinting surface, it would be utterly impractical to attempt to emboss both sides of a sheet with independent impressions not wholly complementary of one another. In plating, on the other hand, the flexible and yielding character of the markers allows both sides of a sheet to be simultaneously impressed with what appears to be a similar design. Instead of offsetting the material of the paper in one direction only as in embossing, the plating process imparts its design either by extra compression, lack of compression or partial offsetting in either direction, all depending on whether high or low spots or modifications thereof lie opposite one another on the marking elements. The flexible markers and intervening sheet of paper give and take from one another, so to speak, under the pressure of the rolls and very desirable two tone effects will result from the variations in thickness produced thereby in the finished sheet.

One of the chief objections to the plating process lies in the expense and delay in making up and taking down the books or forms, all of which necessarily must be done by hand, while embossing machines can be operated continuously on sheets or on a web of paper without the necessity of making up a book or form and thus may have a far greater rate of production than the plating machine. However, finishing by steel engraved embossing rolls, while faster and less expensive in operation, is considerably more limited in the variety of effects obtainable than the plating process and involves, furthermore, the initial expense of the embossing rolls which makes frequent changes of pattern a matter of prohibitive cost.

By means of the present invention, a plating effect is obtained with the productive capacity of embossing rolls and at little or no cost for change of rolls when different finishes are desired. This is accomplished by employing a pair of hard metal rolls (preferably chilled iron) in rotating engagement under heavy pressure and adapted to have travel through the nip thereof the paper to be finished. According, as it may be desired to finish one or both sides of the paper, one or both of said metal rolls are covered with a marking element or imprinting sheet. The character of this marking element and its manner of attachment to the metal roll constitute most important features of the present invention. In order to function in giving the desired finish of plating, the marking element must be of a flexible

nature; in other words, similar to the marking elements used in plating and to prevent destruction of this flexible element under the heavy working pressures of the rolls, it should be attached so that in effect it becomes an integral part of the roll itself.

The marking element may be a sheet of linen, burlap, canvas, felt, card board, semi-hard rubber, celluloid, leather or other flexible composition of uneven thickness or density so as to imprint an impression upon the paper to be finished. The essential limitations in the character of the marking element are that it shall not be as unyielding and hard as the surface of a metal embossing roll, and shall not be so soft as not to leave any impression in the paper. Between these wide limits an almost innumerable variety of materials may be selected for use as a marking element and the specific examples named above are mentioned as illustrative. The marking element should be suitably attached to the roll by adhesively securing it at all points, preferably by glue or cement, to the periphery of the roll. It is most essential that the marking element be secured in a manner to prevent any possible slip or creep between the relatively soft marking element and the hard surface of the metal rolls. Should by any chance such a slip occur, immediate destruction of the comparatively fragile marking element would take place under the grinding action of the heavy pressure hard metal rolls. The marking element may be as thick as a heavy woolen blanket and in fact such a marking element has been successfully employed. When of tougher or more stable material, even thicker marking elements could be used and the only limitation as to thickness would be its capability of withstanding the grinding action of the hard pressure rolls without being torn off the rolls.

In this connection, it should be noted that the coacting rolls must be positively driven by such gearing connections as will accurately insure the same peripheral speed for both rolls. Any appreciable frictional action between the surfaces of the rolls would, of course, destroy the marking elements particularly under the heavy pressures preferably employed in working the rolls. Also, the manner of applying the marking element by gluing on a sheet as an integral part of the roll may provide for a continuous uninterrupted working surface around the entire periphery of the roll. The rolls may thus run smoothly together without violent strains on the bearings as would be caused by an interruption in the surface, and the paper may be finished without any noticeable mark being caused by the ends of the marking element.

Having called attention in the foregoing to some of the important considerations affecting the invention, a preferable embodiment thereof will now be particularly described.

Fig. 1 is a front elevation of a machine embodying the invention; and

Fig. 2 is a side elevation thereof.

Referring more particularly to said drawings, 1 and 2 indicate the side frame members of a machine analogous to that of a calender. Rolls 3 and 4 have their trunnions carried in bearing boxes 5 and 6 for the upper roll 4 and 7 and 8 for the lower roll 3, and the bearing boxes are slidably mounted in the usual manner in slotted guideways of the side frame members. The bearing boxes 7 and 8 rest at the bottom of the slotted guideways or against some appropriate stop while the upper bearing boxes are hung from screw stems one in each side frame as shown at 9 in Fig. 2. The upper end of each screw stem such as 9 has fixed thereto a handwheel 10 for operating the same in the usual manner so that the bearing boxes 5 and 6 for the upper roll may be raised and lowered and thus the coacting pressure of the roll 4 on roll 3 suitably adjusted. As before stated, this coacting pressure is in the order of several tons, say five to ten tons per square inch of engaged surface.

The rolls 3 and 4 are connected together by positive gearing to insure the same peripheral speed for both rolls and, as shown, gear 14 connected to the shaft of roll 4 meshes with gear 15 on shaft of roll 3. The upper roll 4 is driven through gear 11 from a pinion 12 of power shaft 13 having a suitable belt pulley 13^a thereon. A belt pulley such as 16 or other suitable driving means is provided to receive power from an appropriate source.

A delivery table 17 upon which is supported the paper to be finished (a pile of such paper sheets being indicated at 18) is at the front of the machine and a receiving table 19 is at the rear of the machine. 20 indicates a sheet feeding device for applying the individual paper sheets to the nip of the rolls 3 and 4 and comprises a series of short endless belts 21 traveling around pulleys 22 and positioned properly to engage a sheet fed from the top of the pile 18 by an operator. It will be understood, however, that the present finishing machine may operate equally well on paper in the web as distinguished from sheets, and that in such a case appropriate devices will be provided to feed the web of paper to and from the rolls 3 and 4.

The rolls 3 and 4 are identical in character and each consists of a hard metal cylindrical body portion 4^a, preferably chilled iron, covered by the marking element 4^b which is partly shown in section in Fig. 1 on the upper roll. This marking element 4^b may be a sheet of linen, burlap, canvas, felt, paper, cardboard, semi-hard rubber, celluloid, leath-

er or other composition having an equivalent flexible character and in applying it to the metal roll 4^a it is first cut to exactly fit the periphery of the roll and is then adhesively secured by glue or cement throughout its entire area to the metal roll. The aim should be to make the marking element as far as possible an integral part of said metal roll, and to prevent the possibility of any relative slip between the marking element and roll during the operation of finishing the paper. Preferably the marking element is made to completely surround the roll and the line 4^c in Fig. 1 indicates where the ends of the marking element abut in being applied and secured to the roll. Due to the manner of attaching the marking element, this abutting line which is the only break in the continuity of the marking surface is almost negligible and leaves little or no perceptible mark on the finished paper.

The hard, unyielding character of the rolls 3 and 4 serves to compress the flexible marking element into the surface of the paper in a manner very similar to the plating process. With the present machine, the paper sheets may be fed to the nip of the rolls in rapid succession or in a web and thus greatly accelerate production over that previously obtained by plating. Furthermore, any desired change of pattern for the finished paper is as cheaply obtained as with plating, since only the marking element of the rolls need be changed. These marking elements are generally inexpensive and may in some cases be destroyed for removal from the roll without prohibitive cost.

Another feature of advantage to note in the present machine is that the paper may be finished uniformly throughout the entire area passing through the nip of the rolls and this makes unnecessary any subsequent trimming of the edges of the paper as is very often necessary with other finishing machines. It is also possible under the great working pressure employed with the rolls to pass several superposed sheets simultaneously through the rolls so that each will receive the impression of the marking member though, of course, to a lesser degree than when the markers act directly on a single sheet.

What I claim is:

1. In a machine for finishing the surface of paper comprising in combination, a pair of pressure rolls each of which includes a substantially inflexible non-yieldable body portion, a flexible and comparatively fragile paper marking element adhesively secured throughout its area to the periphery of one of said rolls so as to act as an integral part of the surface thereof, interengaging gears fixed to said rolls for driving them at the same peripheral speed so that any frictional action therebetween sufficient to destroy the fragile marking element is avoided.

2. In a machine for finishing the surface of paper comprising in combination, a pair of pressure rolls each of which includes a substantially inflexible non-yieldable body portion, a flexible and comparatively fragile paper marking element, adhesively secured throughout its area to the periphery of one of said rolls so as to act as an integral part of the surface thereof, interengaging gears fixed to said rolls for driving them at the same peripheral speed so that any frictional action therebetween sufficient to destroy the fragile marking element is avoided, and means associated with said rolls for moving them apart to permit the removal from or the securing of a marking element to the surface of either of said rolls.

In testimony whereof I have affixed my signature.

JAMES SPEED.