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F. C. LADD
PAPER FINISHING MACHINE
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2,065,189

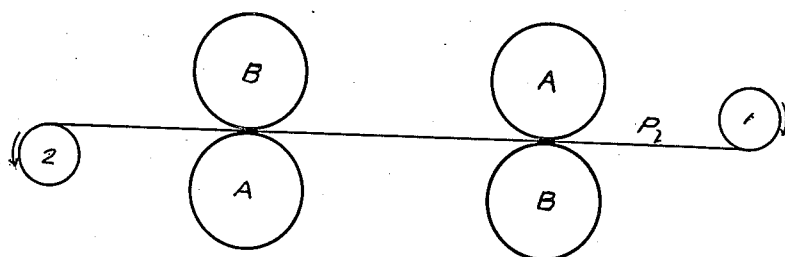


Fig 1

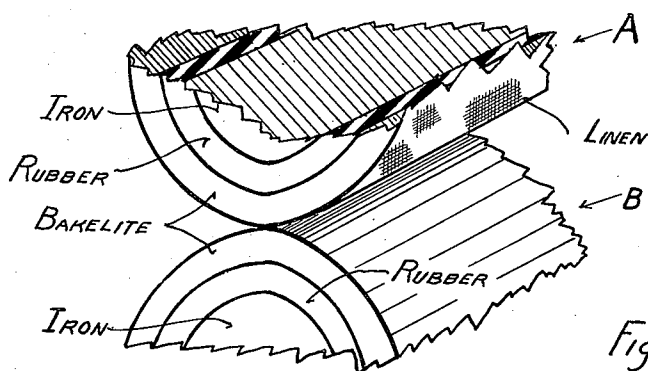


Fig 2

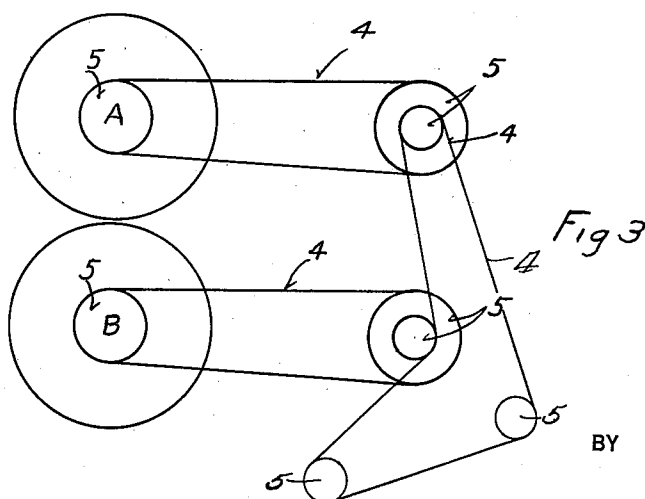


Fig 3

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PAPER FINISHING MACHINE

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3 Claims. (Cl. 101—23)

This invention relates to a method and apparatus for applying a linen finish in the paper making art. Modern machine methods of the prior art are shown by my prior Patent 1,352,611 and the patent to Hanson 1,929,355. These prior art methods are commercially successful in some forms but they cannot apply the linen pattern with the clearness or the exactness of image which is highly desirable in the particular paper finish which is given by the present invention.

In the prior machines the linen and paper are pressed together between rotating calender rolls and there is substantial distortion from true rolling pressure contact over the pressure zone where the linen pattern is being transferred. This distortion results in a slip between the paper and linen and the slip results in a polishing action on the paper. But this polishing action, while desirable by itself, has the disadvantage of smearing the linen pattern. The latter cannot be transferred to the paper with a "clear cut" result, when the paper is polished in the same rolling pressure operation as the one used to transfer the pattern. This is the difficulty in the prior art that my present invention overcomes.

My method and apparatus are disclosed with reference to the accompanying drawing, in which—

Fig. 1 is a diagrammatic representation of one type of calender roll operation;

Fig. 2 is not drawn to scale but represents the character of the layers on my calender rolls; and

Fig. 3 indicates an arrangement of calender roll driving means contributing to my plan of avoiding objectionable slip as the linen pattern is applied to the paper.

In Fig. 2 I have disclosed one way to make up the calender rolls. A roll of iron is covered with a layer of semi-hard rubber and outside the rubber with a layer of bakelite. The latter gives a hard rolling contact. It is also of advantage in fixing a complete covering of linen (with a joint made by abutting edges) on the roll because the linen can be embedded in the bakelite when soft and "frozen" in place as the bakelite hardens. This anchors all the linen threads to the roll and they will not slip. I prefer to have the linen threads protrude on roll A, for example far enough radially to give a pure linen texture to the surface with a hard backing on the linen as its pattern is transferred. The linen threads can be compressed radially but cannot yield laterally because they are anchored in the bakelite.

For the machine set-up indicated in Fig. 1, I make the roll B like roll A except that B is not

covered with linen. To get the best out of my arrangement I drive both pairs of calender rolls A—B and B—A of Fig. 1, as indicated in Fig. 3. Any one of the shafts with sprockets 5 may be driven and silent chains 4 characterized by exact timing relation between sprockets will be driven so rolls A and B must have the same surface speed at all times so far as their driving means can bring this about.

The paper may be finished by running from a feed roll 1, between rolls A—B stamping the pattern on the upper side, between rolls B—A stamping the pattern on the lower side and thus wound up in roll 2. When a polish on the paper is desired I put it on with a calender polishing machine either before or after the linen pattern is put on the paper. By so doing I can control the amount of polish with relation to the pattern in a better manner, than when the polish is added at the same time as the linen pattern. Even when the polish is put on after the pattern, the latter will have a different and sharper "line" than if the polish is put on at the same time.

Instead of using two sets of calender rolls I may use only one set and cover roll B with linen or not, depending on whether I want the pattern on one or both sides. With both rolls A and B covered with linen the pressure effect is much the same as if I put two layers of linen on roll A and none on roll B, as described for the set-up of Fig. 1. I may run linen strips and paper between the rolls. I prefer to apply only a single linen layer to the calender roll, but I can get very close indeed to the best effect by more than a single layer of linen under the pressure zone of the calender contact and under the character of rolling pressure it gives the paper and linen in the linen pattern transfer.

This character of rolling pressure I will now describe as I understand it. It is a hard rolling pressure on account of the bakelite layer. As the calender rolls must be pressed together to get the squeeze on the linen and paper, the rubber layer is present for the rolls to yield and avoid grinding action on linen and paper. When the pressure is applied with my rolls in their rotation the pressure is partially dispersed by the rubber layer and the calender roll is distorted. It is distorted through the body of the roll and the distortion is not localized nor confined close to the contacting area of the rolls, the linen, and the paper. That area in my arrangement is one backed up by the hard layer of the roll and the major part of the distortion of the roll is thrown upwardly into the rubber layer forming part of

the body of the roll where it will do no harm. As the rolls get the linen and paper between them for the rapidly rolling squeeze or pattern stamping operation, the hard tread on the roll gives the desired "blow" or stamp of the linen on the paper. My conception of it has an analogy in the terms of the prize ring; the punch is a hard one, but it is "pulled" in time so that it has a sharp sting rather than the damaging effect of a blow that is followed through with the same force that makes the contact. I want a hard "stinging" contact of linen against the paper and I want to disperse the force giving that contact before it crushes the paper and linen. By accomplishing this kind of rolling contact between paper and linen I avoid both the damage resulting from rolls which do not yield enough and rolls which yield so much at the area of contact as to substantially polish and partially obliterate the linen pattern applied. Thus I get the sharply defined linen pattern on the paper that is wanted and without going to all the trouble of a platen method with flat sheets of linen and zinc in the old "book" formation. The latter is very expensive on account of the hand operations. I believe I am the first to get a rolling machine operating method to give the very sharply defined linen transfer to ordinary writing paper of good quality.

This is the principal object of my invention and I claim what I have generally and specifically disclosed as new.

I wish to point out that other hard substances and elastic substances can be used in place of bakelite and rubber, which I have used as convenient and specific substances with desired characteristics in my disclosure.

I claim:

1. A paper finishing machine having two calender hard pressure rolls, at least one of which is composed of a cylindrical outside layer of hard substance, an intermediate layer of comparatively soft and elastic substance, a rigid core body, and a superficial layer of linen cloth bonded over the entire cylindrical working surface of said hard substance to form part of the composite calender roll.

2. A calender roll for the purpose described comprising an outer layer of hard plastic substance over its entire surface, a covering of linen partially embedded and frozen in said substance, a layer of comparatively soft and elastic substance under said plastic layer and a hard core or shell for the roll inside said soft layer.

3. A calender machine for stamping linen finish on writing paper, comprising a pair of calender rolls, each provided with a hard layer on the outside over its entire surface and a comparatively soft and elastic layer under the hard layer so as to provide a hard rolling pressure contact between the two rolls for the paper and linen and to avoid damage from such contact by partially dispersing the force in said soft layers while maintaining sufficient rigidity to drive the linen pattern into the paper without relative slip between linen and paper, linen pattern cloth being bonded over the entire area of the cylindrical working surfaces of said pressure rolls and constituting fixed parts of said rolls to receive the paper between them for the linen finish.

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