June 23, 1931. K. SIEG 1,810,930

PAPER CORRUGATING MACHINE

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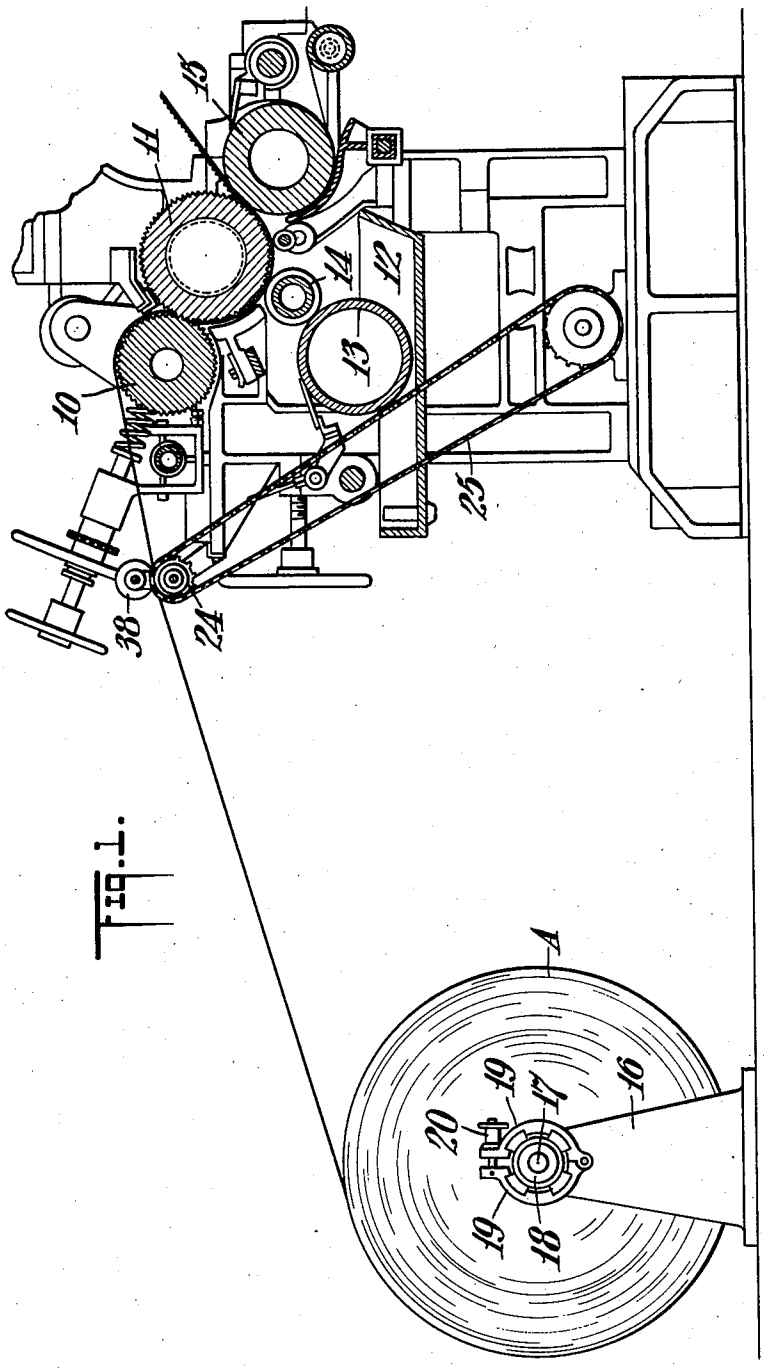

Fig. 1.

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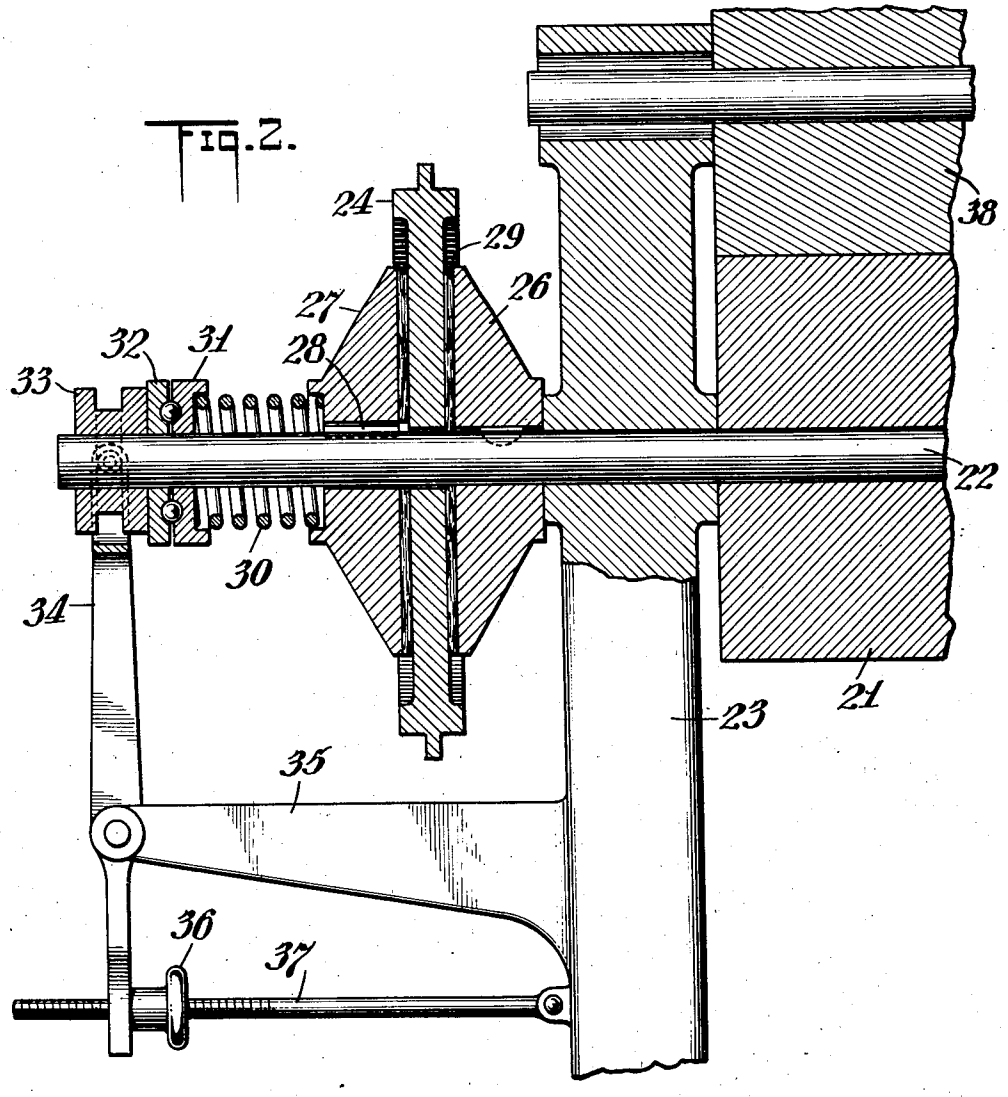
Fig. 2.



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UNITED STATES PATENT OFFICE

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PAPER CORRUGATING MACHINE

Application filed October 24, 1928. Serial No. 314,587.

In the corrugating of straw paper to make single or double faced corrugated board, it is usual practice to pull the paper from the supply roll into the teeth of the corrugating rolls by the rotation of the latter and this action causes it to drag over the teeth which are coming into mesh and also to bend sharply around the ends of the teeth. The tensile strains and bending strains put on the paper by reason of this dragging and bending action is comparatively high and increase rapidly with increase in the speed of the machine.

Due to the wide variations in tensile strength and bending qualities, some paper will fracture at the bends under the hard punishment to which it is subjected in the machine if the paper be run at not to exceed eighty-five feet per minute, while other papers may be run two hundred and fifty feet per minute in the machine without showing fracture.

In practice the tensile strain on the paper being delivered from the roll varies, due to unbalanced condition of the supply roll, the fly wheel effect of the supply roll, if it be large, the reducing diameter of the roll as the paper is unwound, and variations in the braking action of the frictional resistance.

If the tension on the paper due to these or other causes varies between comparatively wide limits, the speed of the machine is practically limited to what the paper will stand at the higher limit of tension.

The main object of the present invention is to provide and maintain a substantially uniform, definite and comparatively low tension on the paper as it goes into the corrugating rolls, and irrespective of the size or unbalanced condition of the supply roll of the straw paper, or the speed at which it is delivered.

By use of my invention paper having poor tensile and bending qualities will not break under the tensile strain or under the bending strain, even when the machine is operated at speeds which have heretofore been possible, only with the very best grades of paper.

The supply roll of paper is ordinarily provided with a friction brake for retarding the rotation of the roll and putting the paper under tension. In carrying out my invention I provide a feed mechanism between the supply roll and the corrugating rolls, and drive this feed mechanism through a slip friction connection which may be adjusted in respect to the brake friction at the supply roll. The friction at the feed is adjusted so as to be slightly less than the friction of the brake on the feed roll. Thus the feed alone is ordinarily unable to exert sufficient pull on the paper to rotate the supply roll, but the corrugating rolls and the feed roll acting in series are sufficient to turn the supply roll, and the tension on the paper between the corrugating rolls and the feed rolls will be very much less than that between the feed rolls and the supply roll. In other words, the paper as it enters the corrugating rolls is not subjected to the high tension required for rotating the supply roll, nor is it subject to the wide variation in tension, such as occurs in the rotation of an eccentric supply roll, but at the same time the paper is delivered to the corrugating rolls under such tension as will effect proper feeding action. The two slip friction devices, one at the supply roll and the other at the feed roll, work against each other, and the corrugating rolls act to supplement the friction at the feed and overcome the friction at the brake.

By the simple expedient of adding a friction feed between the supply roll and the corrugating roll, I am able to very greatly increase the speed of the corrugator with less liability of cutting or breaking the paper. The added mechanism is very simple in design, economical to manufacture, and may be readily added to existing machines.

In the accompanying drawings I have illustrated merely one embodiment of my invention. In these drawings:

Fig. 1 is a vertical longitudinal section through a corrugator provided with my improved slip feed, and

Fig. 2 is a sectional detail of the feed on a very much larger scale.

The corrugator which I have illustrated in the accompanying drawings may be substan-

tially identical with that shown in the Langston Patent 1,642,782, issued September 20, 1927, except for the slip feed attachment. The machine illustrated has a pair of corrugating rolls 10—11, an adhesive container 12, an adhesive pick-up roll 13, a transfer roll 14, and a roll 15 for applying the plain sheet to the crowns of the corrugations of the corrugated sheet.

The paper is delivered from a supply roll A which is mounted on any suitable form of standard 16. The roll shaft 17 on which the roll of paper is secured is provided with a brake drum 18 which is engaged by a pair of brake shoes 19 pivoted together and to the standard 16, and provided with adjusting means 20 whereby the desired braking action may be applied to prevent free rotation of the supply roll and to put the paper under tension.

In carrying out my invention I provide a slip feed mechanism acting on the paper between the supply roll A and the corrugating rolls 10—11. This is illustrated particularly in Fig. 2 as a feed roll 21 secured to a shaft 22, which latter is mounted in brackets 23 attached to the frame of the corrugator. The roll shaft 22 has a sprocket wheel 24 thereon, and this is driven by a chain 25 from the drive shaft of the corrugator or any other suitable driven part of the latter, so that the speed of the sprocket wheel will bear a definite relationship to the speed of the corrugator rolls 10—11.

Instead of keying the sprocket wheel 24 on the feed roll shaft 22, I connect it by a slip friction mechanism or friction drive. This is illustrated as including a pair of disks 26—27 keyed on the shaft on opposite sides of the sprocket wheel. One of these disks, 26, is held against longitudinal movement, while the other, 27, is slidable on a key 28, and each disk has a friction liner 29 engaging the surface of the sprocket wheel. A yielding pressure is applied to the disk 27, and this may be adjusted so as to vary the frictional connection between the driving disks and the sprocket wheel. As shown, a coil spring 30 acts on the disk 27 and abuts against a collar 31 which latter is spaced by anti-friction thrust bearings from a collar 32. Slidable on the shaft 22 is a third collar 33 which is mounted in a yoke on an adjusting lever 34. The lever 34 is pivoted intermediate of its ends to a bracket 35, and is adjusted in any suitable manner, as for instance by means of a nut 36 on an adjusting screw 37. By varying the positioning of the nut 36 the tension on the spring 30 may be varied so that the amount of friction applied to the sprocket will be so light that the sprocket may freely rotate without turning the feed roll 21, or may be so great that slippage between the sprocket and the feed roll 21 is positively prevented.

In practice the friction drive is so adjusted that it will be slightly less than the friction on the brake drum 18. Thus the feed roll 21 will pull on the paper but will not pull with sufficient force to overcome the friction at the brake. The comparatively slight additional pull required to rotate the feed roll is given by the corrugating rolls, and thus there will be a tension but at the same time a comparatively low one, on the paper between the feed roll and the corrugating rolls.

I have illustrated a pair of feed rolls, the upper one, 38, being an idler, and resting on the paper to hold the latter in contact with the feed roll 21. This is desirable if the path of movement from the supply roll to the corrugating rolls be a comparatively straight one, so that the paper will be nearly tangential to the feed roll, but if the direction of feed be such that the paper follow the surface of the roll 21 through a considerable arc, then the upper feed roll 38 may be omitted or lifted out of operative position.

The surface of the feed roll 21 may be such as will provide a friction grip on the paper, and will normally prevent slippage of the paper between the feed rolls or over the single feed roll, if one of them be omitted or out of operation. The pulling effect of the feed roll on the paper will not entirely overcome the friction of the brake at the supply roll, as it is essential that the paper be delivered under tension to the corrugating rolls.

It will be noted that the friction on both the brake and the feed roll may be independently adjusted. It will of course be evident that to secure the proper tension on the paper either friction may be adjusted in respect to the other. Both frictions may be adjusted in accordance with the character of the paper, and if necessary, from time to time during the operation of the machine as the supply roll decreases in size, and without stopping the machine.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A machine for making corrugated paper, including a pair of intermeshing corrugating rolls, means for supporting a supply roll of paper to be corrugated, a feed roll engaging the paper between the supply roll and the corrugating rolls, a slip friction brake on the supply roll, and a slip friction drive on the feed roll, the frictional resistance of said drive being such that the paper is delivered under tension from said drive to said corrugating rolls.

2. A machine for making corrugated paper, including a pair of intermeshing corrugating rolls, means for supporting a supply roll of paper to be corrugated, a feed roll engaging the paper between the supply roll and the corrugating roll, a friction brake on the supply roll, a slip friction drive on the feed

roll, and means for adjusting the friction of the drive of the feed roll so that it is slightly less than the friction of the brake of the supply roll.

3. A machine for making corrugated paper, including a pair of intermeshing corrugating rolls, means for supporting a supply roll of paper to be corrugated, a feed roll engaging the paper between the supply roll and the corrugating rolls, and a pair of slip friction devices, one tending to prevent rotation of said supply roll and the other tending to effect rotation of said feed roll and the unwinding of the paper from the supply roll.

4. A machine for making corrugated paper, including a pair of intermeshing corrugating rolls, means for supporting a supply roll of paper to be corrugated, a feed roll engaging the paper between the supply roll and the corrugating rolls, and a pair of slip friction devices, one tending to prevent rotation of said supply roll and the other tending to effect continuous rotation of said feed roll and the unwinding of the paper from the supply roll, the friction of said first mentioned device exceeding the friction of said second mentioned device, whereby the paper between the feed roll and the corrugating roll will be under tension.

5. A machine for making corrugated paper, including a pair of intermeshing corrugating rolls, means for supporting a supply roll of paper to be corrugated, a friction brake for resisting the free rotation of the supply roll, and slip friction means acting on the paper intermediate the supply roll and the corrugating rolls, and acting in conjunction with the pull of the corrugating rolls, to overcome said friction brake, but to deliver the paper under tension to said corrugating rolls.

6. A machine for making corrugated paper, including a pair of corrugating rolls having intermeshing teeth for drawing the paper therebetween, bending it around said teeth and forming the corrugations, means for supporting a supply roll of paper to be corrugated, a slip friction brake for resisting the rotation of the supply roll, and a feed roll engaging the paper between the supply roll and the corrugating rolls, and exerting a pull on the paper, said pull being insufficient to entirely overcome the action of said slip friction brake, whereby the corrugating rolls pull in the paper from said feed roll under a tension supplementing the pull of the feed roll to overcome the resistance to the rotation of said supply roll.

7. A machine for making corrugated paper, including a pair of corrugating rolls having intermeshing teeth for drawing the paper therebetween, bending it around said teeth and forming the corrugations, means for supporting a supply roll of paper to be corrugated, a slip friction brake for resisting the rotation of the supply roll, a feed roll engaging the paper between the supply roll and the corrugating rolls, and means for driving said feed rolls at the same speed as said corrugating rolls, and said feed roll having associated therewith a slip friction surface whereby the feed roll exerts a pull insufficient to entirely overcome the action of said slip friction brake and reduces the tension on the paper between the feed roll and the corrugating rolls.

8. A machine for corrugating paper, including a pair of intermeshing corrugating rolls, means for supporting a supply roll of paper to be corrugated, a slip friction brake on said supply roll and a feed roll engaging the paper between the supply roll and the corrugating rolls, and exerting a pull on the paper insufficient to entirely overcome the action of said slip friction brake, whereby the tension on the paper between the feed roll and the corrugating rolls is reduced to a substantial degree.

9. A machine for making corrugated paper, including means for supporting a supply roll of paper to be corrugated, a slip friction brake for resisting but not preventing rotation of said supply roll, corrugating rolls exerting a pull on the paper, and means between said corrugating rolls and said supply roll for exerting on the paper a continuous pull insufficient to overcome the resistance of said brake, whereby the paper delivered from said means to said corrugating rolls is maintained under a tension which is lower than the tension on the paper between said supply roll and said means.

10. A machine for making corrugated paper, including means for supporting a supply roll of paper to be corrugated, a slip friction brake for resisting but not preventing rotation of said supply roll, corrugating rolls exerting a pull on the paper, and slip friction means engaging the paper between the corrugating rolls and said supply roll for exerting a pull on the paper insufficient to overcome the resistance to the rotation of said supply roll exerted by said brake.

Signed at Camden, in the county of Camden and State of New Jersey, this 15th day of October A. D. 1928.

KARL SIEG.