Sept. 20, 1927. 1,642,782

S. M. LANGSTON

MACHINE FOR MAKING CORRUGATED PAPER

Filed March 20, 1923 2 Sheets-Sheet 1

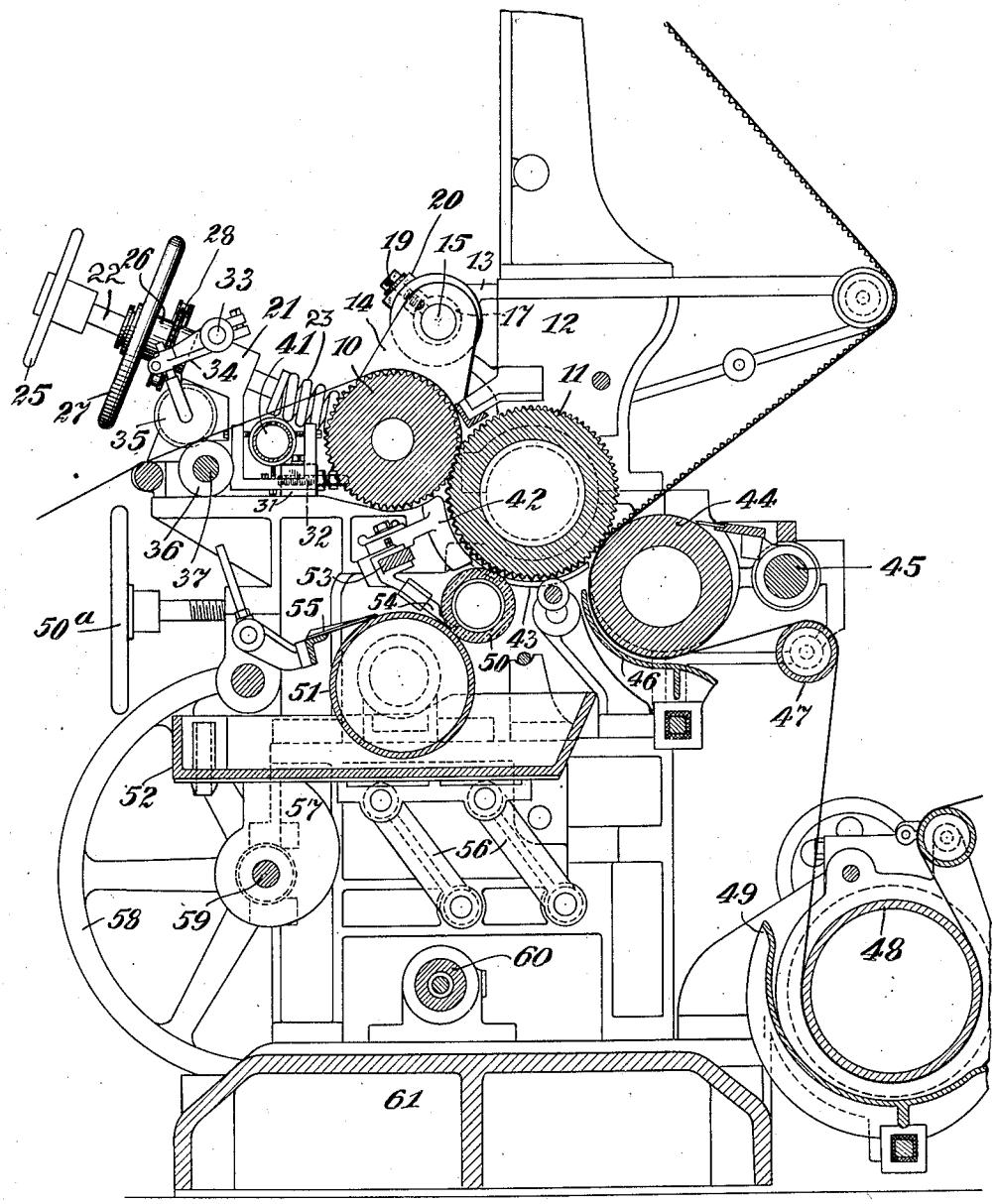


Fig. 1.

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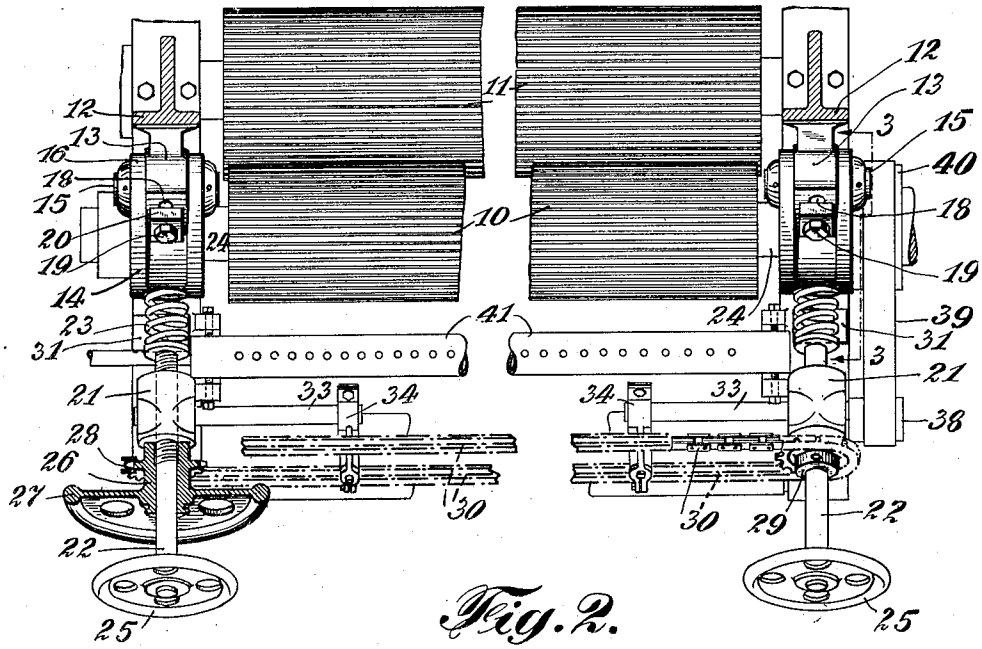


Fig. 2.

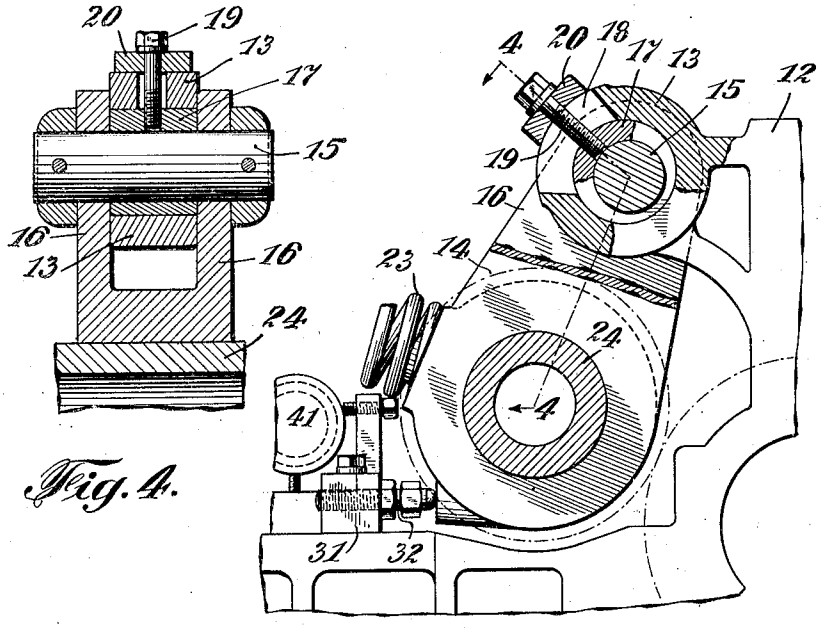


Fig. 4.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING CORRUGATED PAPER.

Application filed March 20, 1923. Serial No. 626,258.

This invention is an improvement in machines for corrugating paper by causing it to pass between rollers having intermeshing corrugations in the form of longitudinally extending ridges and grooves. Machines of this general character are shown and certain features thereof claimed in my prior Patents 929,451, issued July 27th, 1909, and 1,186,997 and 1,186,998, issued June 13th, 1916.

My present invention, as will hereinafter appear, is of such a character that it may be employed in connection with the features shown and claimed in said patents, or may be employed in various other types of machines having intermeshing corrugating rollers.

It is customary to so mount the bearings of the corrugating rollers that the rollers may be readily moved out of mesh for threading, cleaning or repairing, and to apply yielding pressure to hold them in full meshing position during corrugating operation, the yielding support or backing serving to take care of irregularity or variation in the thickness of the sheet being corrugated. Such means has operated satisfactorily for certain speeds, but all attempts to drive the corrugating rollers faster than such speed have resulted in non-uniform corrugations in the product or the cutting of the sheet by the pressing together of the meshing teeth or corrugations.

The main objects of my invention are to better adapt the corrugating mechanism to high speed operation, to insure uniformity of the product, and to avoid liability of cutting or weakening the web by the action of the rollers.

To insure these objects I provide as one important feature of my invention means whereby the two bearings of one of the corrugating rollers may be adjusted toward and from the other to bring said rollers into and out of mesh, and there is also provided means whereby one bearing may also be adjusted independently of the other in a direction substantially at right angles to the first mentioned adjustment to secure absolutely accurate parallelism of the roller axes and teeth.

As a further important feature I employ stop mechanism for absolutely holding the rollers in true and full meshing position and permit only such yielding as is necessary to take care of irregularity in the thickness of the web. Thus all chattering or vibration of the roller against its yielding support during high speed rotation is prevented.

A further object of my invention is to facilitate the independent or simultaneous adjustment of the spring tension on the bearings of the adjustable roller. To accomplish this object I provide means whereby the spring pressure on the two bearings which are at opposite ends of the machine may be controlled from a single point.

Other advantages and important features will be pointed out hereinafter, or will be apparent from a consideration of the specific mechanism illustrated in the drawings.

In the accompanying drawings:

Fig. 1 is a vertical, longitudinal section through the center portion of the machine.

Fig. 2 is a top plan view of certain of the parts, other parts being broken away.

Fig. 3 is a section on the line 3—3 of Fig. 2, and

Fig. 4 is a section on the line 4—4 of Fig. 3.

The machine illustrated is designed for the manufacture of single faced corrugated paper which may constitute the final product or be delivered direct to another machine to have the additional facing strip put on. The sheet to be corrugated is caused to pass between a pair of intermeshing corrugating rollers 10 and 11 which are preferably of hollow steel forgings each made of a solid piece, and with the external surface provided with grooves or ridges which when intermeshing impart corrugations to the sheet passing therebetween. The rollers are made hollow not only to reduce weight but to permit heating by the delivery of steam through the bearings thereof. The roller 11 is mounted in stationary bearings and the present invention relates primarily to the means for supporting, adjusting and controlling the movement of the bearings of the roller 10. The two main end frames 12 of the machine are provided with bracket portions 13, each serving as the support for a pivoted arm 14. The bearings of the roller 10 are carried by the arms 14, and the position of the pivotal supports for the arms is such that as the arms swing about their pivotal supports the roller 10 is moved toward and from the roller 11 substantially in the plane defined by the axes of the two rollers. The pivotal connection between each arm 14 and its supporting

bracket 13 is such that the arm may have not only a swinging movement, but may also have its center of movement adjusted substantially in the direction of length of the arm.

The pivotal connections as illustrated include a pin 15 having its ends journaled in the two forks 16 of the arm 14, and which extend upon opposite sides of the bracket 13. The bracket 13 has an aperture therethrough of somewhat larger diameter than the pin 15 and fitting on the pin 15 is an eccentric sleeve 17. The sleeve is normally rigid with the bracket so that the arm 14 may swing about the axis of the pin 15 as a center. By oscillating the sleeve 17 within its bearing in the bracket 13 the position of the pin 15 may be varied. It will be noted that one component of this movement of the pin 15 is in the direction of the length of the arm 14. As the pivotal connections of the two arms 14 on their separate brackets 13 are independent of each other, it will be noted that by adjusting either eccentric sleeve one end of the roller 10 may be raised or lowered in respect to the other end, and without interfering with the capability of the roller being swung toward and from the other roller 11. Although I have shown the eccentric sleeve forming the connections between the pin and the stationary bracket, it will of course be obvious that the reverse arrangement, namely the placing of the eccentric sleeve between the pin and the swinging arm would accomplish the same result. Various means may be employed for locking the eccentric sleeve in its adjusted position. As illustrated the bearing 13 has a slot 18 and the sleeve has a threaded pin 19 projecting radially therefrom through the slot. The pin is shown in the form of a screw bolt and between the head of the bolt and the periphery of the bracket 13 there is provided a clamping plate or washer 20 whereby when the screw is loosened the screw itself may serve as a handle for rotating the sleeve, and when tightened clamps the washer 20 to the periphery of the bracket and locks the sleeve against rotation.

In the commercial manufacture of large machines of this general character absolute accuracy in the forming of the two end frames is difficult to secure and there is liable to be slight warping of the parts or of the base or floor upon which the machine sets. I have discovered that to avoid cutting or crushing of the paper during high speed operation it is essential that the corrugating rollers have their axes in perfect parallelism so that the teeth mesh in exactly the same way at one end of the roller as at the opposite end. By means of my improved construction this parallelism may be readily secured and may be re-established at any time in case of further warping or distorting of the machine frame or warping or settling of the foundations or floor upon which the machine stands. I have illustrated both of the arms 14 as having eccentric bearings, but it will be obvious that so far as adjusting to secure parallelism is concerned, only one end of the roller need be adjusted. By providing the eccentric sleeves for both arms advantageous results are secured, in that in some cases it is more advisable to lower one end of the roller than it is to raise the other.

The main frame of the machine is illustrated as provided with a pair of brackets 21, and extending through these brackets and having threaded engagement therewith are adjusting rods 22. These rods are disposed substantially in the plane of the axes of the two rollers 10 and 11, and approximately at right angles to the general direction of the arms 14. Between the lower or inner end of each adjusting rod and the corresponding arm 14 is a heavy coil spring 23. The springs act against the lower portions of the arms which serve as bearings for the shaft 24 of the adjustable roller 10. By rotating the adjusting rods 22 the spring pressure exerted on the roller 10 may be varied at will. In operation sufficient pressure is exerted so as to hold the two rollers firmly in mesh and force the paper to follow the corrugations of the rollers. The higher the speed of operation the greater must be the spring pressure which is exerted.

As one important feature of my invention I provide means whereby the tension of the two springs which are at opposite ends of the machine may be controlled from a single point. As illustrated the adjusting rods 22 have hand wheels 25 for rotating them. One of the rods 22 is provided with a sleeve 26 which has a hand wheel 27 adjacent to the corresponding hand wheel 25, and also has a sprocket 28. This sleeve is freely rotatable on its rod 22. The other rod 22 has a sprocket 29 secured thereto and held against rotation thereon. The two sprockets 28 and 29 are connected by an endless chain 30. Thus by turning the hand wheel 27 the rod 22 at the opposite end of the machine may be rotated. As the hand wheel 27 is closely adjacent to one of the hand wheels 25, these two hand wheels may be rotated simultaneously to put the two springs 23 under greater or lesser pressure, and thus increase or decrease the spring pressure exerted on both ends of the roller 10. If desired simple catch mechanism may be provided for locking the hand wheel 27 to the adjacent hand wheel 25 or to the supporting rod 22, so that whenever desired the two rods may be simultaneously rotated by rotating the single hand wheel 27. The hand wheel 27 is preferably at the same end of the machine as are the various other operating handles of the machine, some of which will be hereinafter referred to. The

operator while standing at the controlling end of the machine may independently adjust the spring pressure on the two ends of the roller 10. He may relieve the pressure so as to permit complete separation of the rollers for threading, cleaning or repairing, and may increase the pressure at both ends as the speed of the machine increases.

At high speed there is a greater tendency of the rollers to separate against the action of the springs 23, and even though these springs be under heavy compression there is liable to be a vibration or chattering due to the bodily in and out movement of the roller 10 against the springs 23. This is objectionable for various reasons, but particularly because it results in a non-uniform product, the corrugations produced in the paper as the rollers separate being lower than those produced when the rollers are forced together into full meshing position. To prevent such chattering and to hold the rollers in proper mesh but at the same time to permit movement against the springs to take care of irregularity in the thickness of the paper, I provide adjustable stop mechanism for limiting the rearward swinging of the arms 14. This is illustrated in the drawings as including a lug 31 on the frame of the machine and spaced from and opposed to the lower end of the arm 14. One of these parts, as for instance the lug 31, carries a set screw 32 which may be adjusted to engage with the other part, namely the lower end of the arm 14. The set screws are normally adjusted to permit the desired swinging movement of the arms, but after the machine has been threaded up and the rollers forced together into full meshing position the set screws 32 which act as the stops, are adjusted so as to prevent any return movement of the arms except such limited movement as is necessary to take care of variations in the thickness of the paper. Thus during high speed operation the rollers are held together with the desired spring pressure, or yielding means, but at the same time the separating movement of the rollers is limited by the stops and the rollers cannot separate to such an extent as will permit any variation in the height of the corrugations produced in the paper.

The brackets 21 serve not only to support the spring adjusting mechanism, but they also carry transversely extending rods 33 upon which are adjustably mounted the brackets 34 for supporting rotary trimming knives 35. These latter may be of the friction driven type and cooperate with and be laterally pressed against knives 36 on a driven shaft 37. As shown this shaft has a pulley 38 and is driven by a belt 39 from a pulley 40 on the shaft 24 of the roller 10.

Preferably two pairs of knives may be adjusted laterally of the machine so as to trim to the desired width the sheet which is to be corrugated. The corrugating of the sheet is facilitated by a steaming roll 41 located adjacent to and in front of the roller 10, and directly beneath the path of the paper. This roll is provided with a row of perforations in its under surface, and serves to direct steam against the sheet so as to moisten as well as heat the latter.

I have illustrated my invention as incorporated in a machine for making single faced paper, and embodying certain features claimed in my prior patents 1,186,997 and 1,186,998. The corrugated sheet, after passing between the two rollers 10 and 11 is held in the corrugations of the roller 11 by shields 42 having fingers 43 terminating closely adjacent to the steam heated pressure roller 44, which applies the facing sheet to the corrugated sheet while the latter is still in contact with the roller 11. The pressure roller 44 may be mounted in eccentric bearings operated from a shaft 45, as claimed in Patent 1,186,997, and the facing sheet may be held on the pressure roller 44 by a guiding or threading board 46 which aids in threading up the machine. The facing sheet is delivered to the pressure roller 44 over an idler 47 and a stationary heating roll 48 which also acts to tension the facing sheet and preheat it at the same time. This heating roll may also have a guiding or threading board 49. Adhesive is applied to the crown of the corrugations by a transfer roller 50 which rotates in contact with a pick-up roller 51, the lower portion of which dips into the silicate pan 52. The transfer roller 50 may be raised and lowered by the action of a hand wheel 50a, and the spacing of the pick-up and transfer rollers is controlled by eccentric bushings for the shaft of the pick-up roller, as claimed in my prior Patent 1,186,998. The transfer roller 50 has peripheral grooves which receive the fingers 43, as claimed in my prior Patent 1,186,997, and the transverse support 53 which supports the shields 42 and fingers 43, also supports cleaning fingers 54 which engage in said grooves to remove the silicate or other adhesive therefrom. The pick-up roller 51 also has a scraper 55 for cleaning the latter every revolution so that there will always be an equal amount of silicate picked up on the surface. The silicate pan is supported on toggle links 56 and a cam 57, so that by turning the hand wheel 58 of the shaft 59 of said cam the pan may be lowered out of contact with the pick-up roller when the machine is stopped or it is desired to clean it. The main drive shaft 60 is mounted on the base 61 of the machine, and all of the main operating parts are driven directly or indirectly from this shaft by suitable gearing or other driving mechanism not illustrated. Preferably the gearing is such that the silicate rollers

50 and 51 may be permitted to continue rotating, even when the main rollers 10, 11 and 44 are stopped, there being a suitable clutch for this purpose. The controller for the clutch, the hand wheels 50ª and 58, the hand wheel 27, and the other main controlling devices of the machine are all located at the same end, and within easy reach of the operator. Certain of the features of the machine hereinbefore described are claimed in my prior patents above referred to.

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

1. A machine for corrugating sheet material including a pair of meshing corrugating rollers, a pair of pivoted arms for supporting one of said rollers and permitting swinging movement thereof toward and from the other roller to vary the extent of meshing of the rollers, and means for adjusting one of said arms in an endwise direction to thereby adjust the end of the roller in a direction substantially at right angles to the plane of the axes of the meshing rollers and without disturbing the extent of meshing of the rollers.

2. A machine for corrugating paper including a pair of meshing corrugating rollers, a pair of pivoted arms carrying one of said rollers and a pair of supporting members, one for each arm, said supporting members being mounted to oscillate, and each having the surface thereof which engages with its corresponding arm eccentric to the axis of oscillation whereby said arms may be adjusted endwise independent of the swinging movement thereof.

3. A machine for corrugating sheet material including a pair of corrugating rollers, a pair of swinging arms supporting one of said rollers whereby the latter may be moved toward and from the other roller to vary the extent of meshing engagement, and pivot pins supporting said arms, said pivot pins having oscillatory eccentric bearing surfaces whereby said arms may be adjusted endwise independent of the swinging movement thereof.

4. A machine for corrugating sheet material including a pair of meshing corrugating rollers, a pair of swinging arms supporting one of said rollers, a pair of pivot pins for said arms, and an oscillatory eccentric sleeve on each pin whereby each arm may be moved in a direction having a component lengthwise of the arm whereby said arms may be adjusted endwise independent of the swinging movement thereof.

5. A machine for corrugating sheet material including a pair of meshing corrugating rollers, a pair of swinging arms for supporting one of said rollers and permitting movement thereof toward and from the other roller, yielding means for resisting separating movement of said rollers, and means independent of said yielding means for preventing separating movement to unmeshed position.

6. A machine for corrugating sheet material including a pair of meshing corrugating rollers, yielding means acting on one of said rollers for pressing them together, and a stop for positively preventing movement of said last mentioned roller to unmeshed position.

7. A machine for corrugating sheet material including a pair of rollers, one of said rollers being adjustable toward and from the other, separate springs one at each end of the adjustable roller and yieldingly holding it in mesh, and adjustable stops at opposite ends of said adjustable roller to limit the movement of said roller against the action of said springs.

8. A machine for corrugating sheet material including a pair of rollers, separate members at opposite ends of one of said rollers for adjusting the ends of said roller in respect to the other roller, and separate means at one end of said roller for independently operating both of said adjusting members.

9. A machine for corrugating sheet material including a pair of meshing rollers, threaded adjusting rods, one at each end of one of said rollers for controlling the adjustment of said ends, and a pair of coaxial hand wheels, one connected to one adjusting rod and the other connected to the other rod.

10. A machine for corrugating sheet material including a pair of meshing corrugating rollers, separate springs, one at each end of one roller to yieldingly hold it in mesh with the other, adjusting members, one adjacent to one spring and the other adjacent to the other for controlling the tension of said springs, and operating members both adjacent to one end of said roller for independently operating both of said adjusting members.

11. A machine for corrugating sheet material, including a pair of corrugating rollers, a pair of springs acting upon opposite ends of one of said rollers for yieldingly holding them in mesh, means at one end of said machine for adjusting the tension of both of said springs, and means at opposite ends of the machine for limiting the separating movement of said rollers against the action of said springs.

Signed at Camden in the county of Camden and State of New Jersey this 16th day of March, A. D. 1923.

SAML. M. LANGSTON.