April 11, 1950 R. J. WATERWORTH 2,503,858

FOLDING MACHINE ROLL ADJUSTING MEANS

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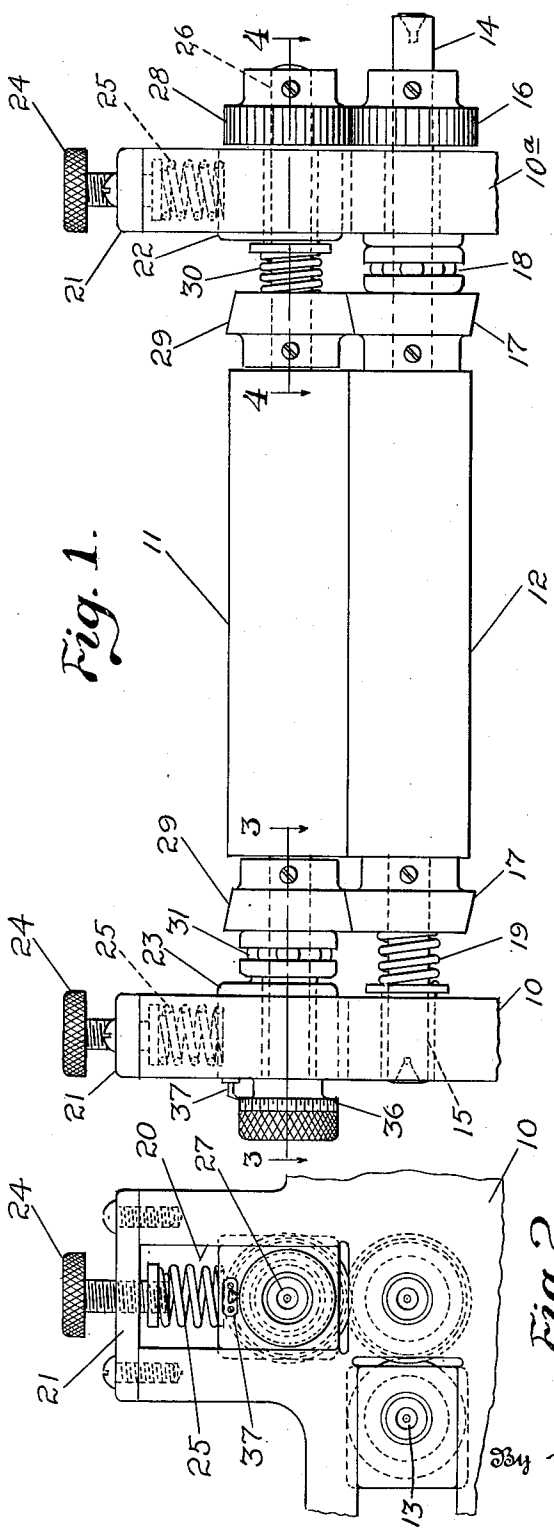


Fig. 1.

Fig. 2.

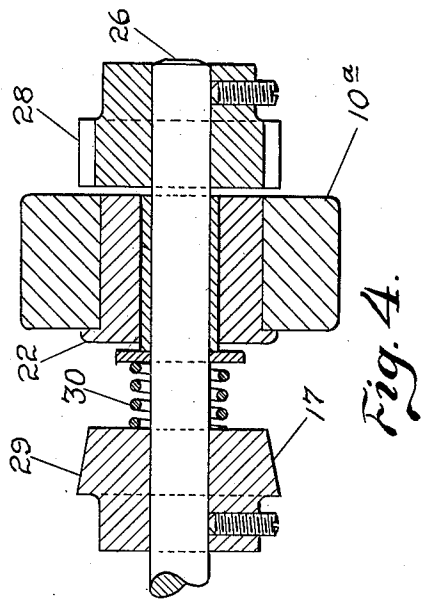


Fig. 4.

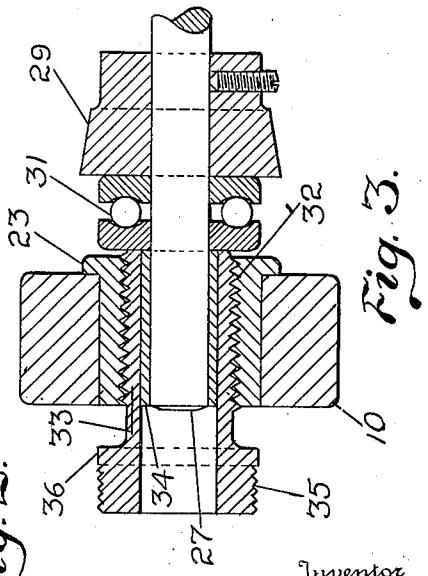


Fig. 3.

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FOLDING MACHINE ROLL ADJUSTING MEANS

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8 Claims. (Cl. 270—68)

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This invention relates to improvement in paper folding machines and pertains particularly to roll spacing mechanism.

In paper folding machines there are provided a number of groups of rollers which cooperate to effect the folding and creasing of paper sheets. These groups of rollers must be set to the correct space or distance apart to produce properly folded sheets. In the machines at present in use one roller of each pair is rotatably supported at its ends in sliding bearing blocks which are set and held in position in guides in the machine frame, by an adjustment nut. A coil spring constantly urges each bearing block toward the adjacent roller to maintain the said rollers in the adjusted position.

The present method of setting the folding machine rollers consists in the operator first adjusting one end of the movable roller through the shifting of the bearing block to the desired extent by the adjustment nut, and then going to the other side of the machine and making as nearly as possible the same adjustment at the other end of the roller. In addition to the fact that it is difficult to get the rollers properly spaced so that they will be exactly parallel, much time is wasted by the operator having to go first to one side of the machine and then to the other and in addition it is necessary for the operator to assume difficult body positions in order to accomplish the work.

The present invention has for its principal object to provide a structure whereby the rolls can be easily and quickly adjusted to the proper spaced position and maintained at all times absolutely parallel, from a position at one side of the folding machine.

Another object of the invention is to provide a paper folding machine roll adjusting mechanism wherein conical collars carried at the two ends of each of the two co-acting rolls are maintained in contacting relation at all times and the desired adjustment of the upper and movable roll with respect to the lower roll, is accomplished by the axial shifting of the movable roll.

Another object of the invention is to provide a novel roll spacing mechanism for a paper folding machine in which there is provided a modified bearing block construction for supporting one end of the movable roll or two cooperating rolls, which includes a rotary element designed to effect the longitudinal shifting of the movable roll and the simultaneous movement of the movable roll relative to the stationary roll by means of co-acting conical members carried by the two rolls,

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while at all times maintaining the rolls parallel.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawing forming a part of the specification, it being understood, however, that the invention is not confined to a strict conformity with the showing of the drawing but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawing:

Figure 1 is a view in elevation of a pair of rolls of a paper folding machine showing the application of the present invention.

Figure 2 is a view of one side of a portion of the machine looking at the ends of the rolls.

Figure 3 is a horizontal section taken substantially on the line 3—3 of Figure 1.

Figure 4 is a horizontal section taken substantially on the line 4—4 of Figure 1.

Referring now more particularly to the drawing wherein like numerals of reference designate corresponding parts throughout the several views, the numerals 10 and 10a designate spaced side frames forming a part of the paper folding machine and held in rigid relation by cross members, not shown, between which are mounted the co-acting paper folding rollers which are designated 11, 12 and 13.

The roller 12 is stationary in the sense that it does not have movement relative to the rolls 11 and 13, transversely of its length, while the rollers 11 and 13 are supported both for axial movement and for movement transversely to their length with respect to the stationary roll.

This invention has to do with the spacing of two or more rolls but since its construction and operation can be adequately set forth by describing it in connection with two rolls only, the description will be so applied but it is to be understood that in restricting the description in this manner there is no intention of restricting the use of the invention in connection with two rolls only.

The roll 12, which will be referred to as the stationary roll even though it may have slight axial movement, has the end shafts or trunnions 14 and 15 in fixed bearings in the sides of the frame and one of these trunnions, such as the trunnion 14, is extended beyond the adjacent side of the frame for connection in any suitable manner with a power shaft whereby rotary motion may be transmitted to the fixed roll and through

this to the shiftable roll or rolls as hereinafter described. There is also mounted upon the extended trunnion 14 the gear pinion 16.

At each end of the fixed roll 12 is a cone wheel 17 and the taper of these wheels extends in the same direction as shown.

Between one cone wheel 17 and the adjacent side of the frame is a thrust bearing which is generally designated 18 while at the opposite end of the roll a spring 19, interposed between the roll and the adjacent side of the frame and encircling the adjacent trunnion, constantly urges the roll 12 axially toward the thrust bearing 18.

The numeral 20 designates a guide in each side of the frame, the outer end of which is bridged by the plate 21. One of these guides has therein the slidable bearing block 22 and the opposite guide has therein the slidable bearing block 23.

Each bridge plate 21 across the outer end of the bearing guide has a spring tension adjustment screw 24 threaded therethrough on the longitudinal center of the guide and directed toward the center of the adjacent bearing block and interposed between the screw and the adjacent bearing block is a compression spring 25 which constantly urges the adjacent block inwardly.

The movable roller 11 has the end shafts or trunnions 26 and 27, the trunnion 26 extending through and being journaled in the bearing block 22 and carrying upon its outer end the gear 28 which meshes with the gear 16. Fixed to each end of the movable roll 11 is a cone wheel 29 and these wheels have their taper extending in the same direction and oppositely to the direction of taper of the wheels 17 with which they frictionally engage as shown.

Encircling the trunnion 26 between the adjacent cone wheel 29 and bearing block 22 is a coil spring 30 corresponding with the spring 19 and normally urging the roll 11 to shift axially toward the bearing block 23. At the opposite end of the roll 11 from the spring 30, is a thrust bearing 31, corresponding with the bearing 18 and having one side or one ball raceway against the adjacent bearing block 23 as shown.

The bearing block or bearing unit 23 is of slightly different construction from the bearing block 22. This block 23 has a threaded bore 32 formed therethrough in which is engaged the externally threaded bearing sleeve 33 in which is mounted the press fit bearing proper 34. This receives and has rotatably mounted therein the trunnion 27.

The inner end of the sleeve 33 engages the outer raceway of the thrust bearing 31 while the outer end of the sleeve is formed integral with the knob 35 by means of which rotation may be given to the sleeve when desired to move the sleeve inwardly or outwardly for the purpose of increasing or decreasing the pressure against the thrust bearing 31.

It will be readily apparent from the foregoing that when the bearing sleeve 33 is moved inwardly against the adjacent bearing the movable roll 11 will be shifted axially against the tension of the spring 30. This will cause the conical rollers 29 to ride up on or toward the high sides of the contacting rollers 17 and will thus shift the roll 11 away from the roll 12. On the other hand when the bearing sleeve 33 is rotated to cause it to shift away from the thrust bearing 31 the spring 30 will effect the opposite axial movement of the roll 11 so as to bring the two rolls together.

Thus the rolls will be maintained in accurate parallel relation at all times while the desired adjustment is being made.

The periphery of the knob 35 may be provided with suitable graduations 36 for co-action with a pointer 37 fixed to the adjacent bearing block. Thus by providing the proper indications upon the knob in association with the graduations the operator may work from one side of the machine to adjust the rolls toward and from each other axially parallel through their entire length to have any desired working space therebetween. In folding machines each group of rollers, together with the grids, end stops, and side registers, could properly be termed a folding station, number so and so, however, in the nomenclature of the print shop or bindery they are called by the fold they perform, thus 1st fold, 2nd fold, 3rd fold, 4th fold, etc. Each of these stations must have the rollers set so as to properly receive the amount of paper thickness passing through at their location, without injury or mar, yet firm enough to hold the paper under control in maintenance of good register. In the view forming Figure 2 a third roll is shown, such roll being designated 13 as previously stated. Three rolls grouped as shown, with grids, etc., not shown, are necessary when producing folds by the buckle method. Only two rolls are used when the paper is introduced to the rolls by a cam operated knife. This invention as previously stated may be used in association with the groups of two rolls or three rolls as desired and when used in association with a group of three rolls, the third roll, in the present illustration designated 13, is equipped with the same bearing block shifting means or control means as roll 11.

I claim:

1. In a folding machine, a stationary roll, a second roll parallel to the stationary roll, a driving connection between the rolls, means for effecting the axial shifting of one of the rolls and operatively coupled members between and carried by the two rolls designed to effect relative movement between the rolls while simultaneously maintaining the rolls parallel, upon the axial shifting of the said one of the rolls.

2. In a folding machine, a pair of parallel contiguous rolls, means supporting one roll for separatory movement relative to the other roll in a direction perpendicular to its axis, an adjustment means for axially shifting one of the rolls, and operatively coupled means between and carried by the adjacent ends of the rolls operating one against the other to effect the movement of the said one roll in the stated direction while maintaining the rolls parallel, when the adjustment means is operated.

3. In a folding machine, a pair of parallel contiguous rolls, means supporting one roll for movement toward and away from the other roll, resilient means normally urging the axial shifting of the rolls in opposite directions, resilient means normally urging the said one roll toward the other roll, operatively coupled means carried by and between the adjacent ends of the rolls operating one against the other to effect the movement of the said one roll in a direction perpendicular to its axis relative to the other roll when one of the rolls is axially shifted, and means for forcing the axial shifting of the said one of the rolls in opposition to the resilient means which is acting upon such roll to shift it axially.

4. In a folding machine, a pair of parallel contiguous rolls, the rolls having end supporting

trunnions, a pair of shiftable bearing blocks through which the trunnions of one roll extend whereby said one roll is supported for movement toward and away from the other roll, resilient means normally urging the bearing blocks in a direction to move the said one roll toward the other roll, a conical wheel carried by each roll adjacent each end, the wheels of each roll having the taper extending in one direction and opposite to the direction of taper of the wheels of the other roll, the wheels of the rolls being in frictional engagement, resilient means normally urging axial shifting of the said one roll in one direction, and means forming a part of one bearing block for imposing axial thrust against the said one roll to axially move the said one roll in opposition to the last stated resilient means.

5. A structure as set forth in claim 4, wherein the stated means for applying axial thrust to the said one roll comprises a bearing sleeve in which a trunnion of the said one roll is rotatably mounted, the sleeve being exteriorly threaded and threaded into the bearing block of which it forms a part and adapted when rotated to move toward or away from the adjacent end of the said one roll to effect the axial movement thereof, the sleeve at the end remote from the said one roll being formed to provide a knob by which its rotation is facilitated.

6. A structure of the character stated, comprising a pair of contiguous parallel rolls, said rolls having end supporting trunnions, supporting bearings for the trunnions of one roll, a pair of shiftably supported bearing blocks for the trunnions of the other roll, tension means engaging the bearing blocks and constantly urging movement of the same in a direction to urge the said other roll toward the first roll, spring means interposed between an end of the said other roll and the adjacent bearing block and constantly urging axial movement of the said other roll in one direction, a thrust bearing encircling the trunnion at the other end of the said other roll and interposed between such other end and the adjacent bearing block, a bearing sleeve encircling the trunnion adjacent to the thrust bearing, said sleeve being externally threaded and threaded into the adjacent bearing block and having contact at its inner end with the thrust bearing, the outer end of the bearing sleeve being formed to provide a knob, a pair of conical wheels carried by the said one roll and having their taper extending in the same direction, and a pair of conical wheels carried by the other roll and having their taper extending in the same direction and in a direction opposite to the taper of the first pair of wheels, the wheels of one of the rolls being in constant frictional engagement with the wheels of the other roll.

7. In a folding machine, a pair of parallel contiguous rolls, means supporting one roll for movement toward and away from the other roll, resilient means normally urging the axial shifting of the rolls in opposite directions, resilient means normally urging the said one roll toward the other roll, means carried by and connected between the rolls for effecting the movement of the said one roll in a direction perpendicular to its axis relative to the other roll when one of the rolls is axially shifted, and means for forcing the axial shifting of the said one of the rolls in opposition to the resilient means which is acting upon such roll to shift it axially, the stated means connected between the rolls, comprising conical members carried by the two rolls and having constant peripheral contact, the direction of taper of the two members on one roll being the same and opposite to the direction of taper of the two members on the other roll.

8. In a folding machine, a pair of parallel contiguous rolls, means supporting one roll for movement toward and away from the other roll, resilient means normally urging the axial shifting of the rolls in opposite directions, resilient means normally urging the said one roll toward the other roll, means carried by and connected between the rolls for effecting the movement of the said one roll in a direction perpendicular to its axis relative to the other roll when one of the rolls is axially shifted, and means for forcing the axial shifting of the said one of the rolls in opposition to the resilient means which is acting upon such roll to shift is axially, the said means for forcing one of the rolls axially comprising a bearing sleeve rotatably supporting an end of the said one roll and a threaded connection between the bearing sleeve and a supporting member for effecting the axial movement of the sleeve when the sleeve is rotated, the axial movement of the sleeve in one direction effecting the application of axial thrust against and axial movement of the adjacent roll.

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