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PAPER FEEDING MECHANISM

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3 Sheets-Sheet 1

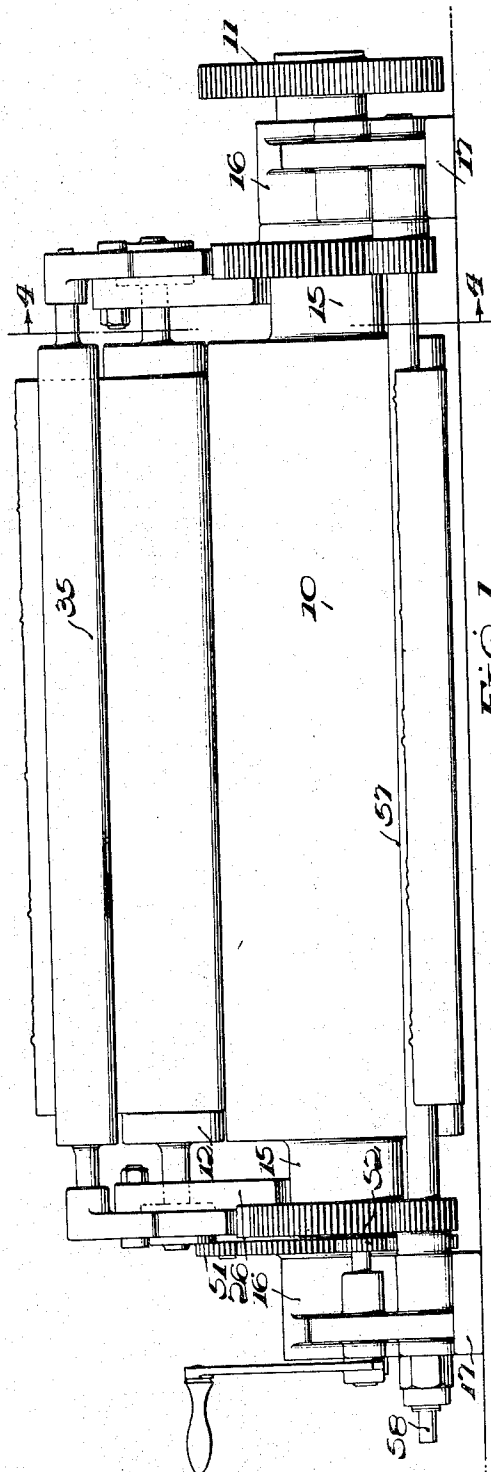


FIG. 1.

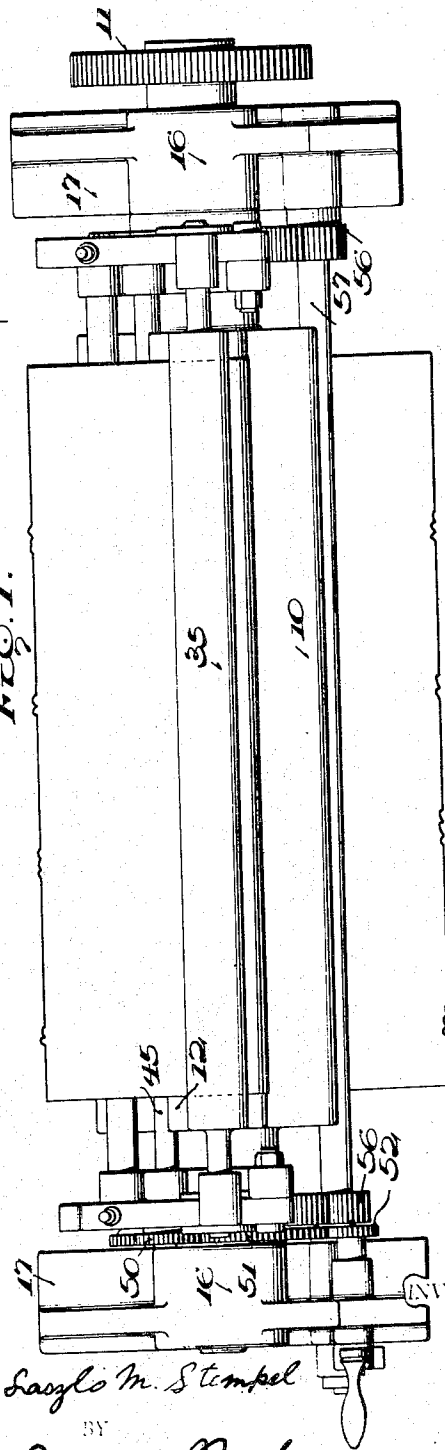


FIG. 2.

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FIG. 3.

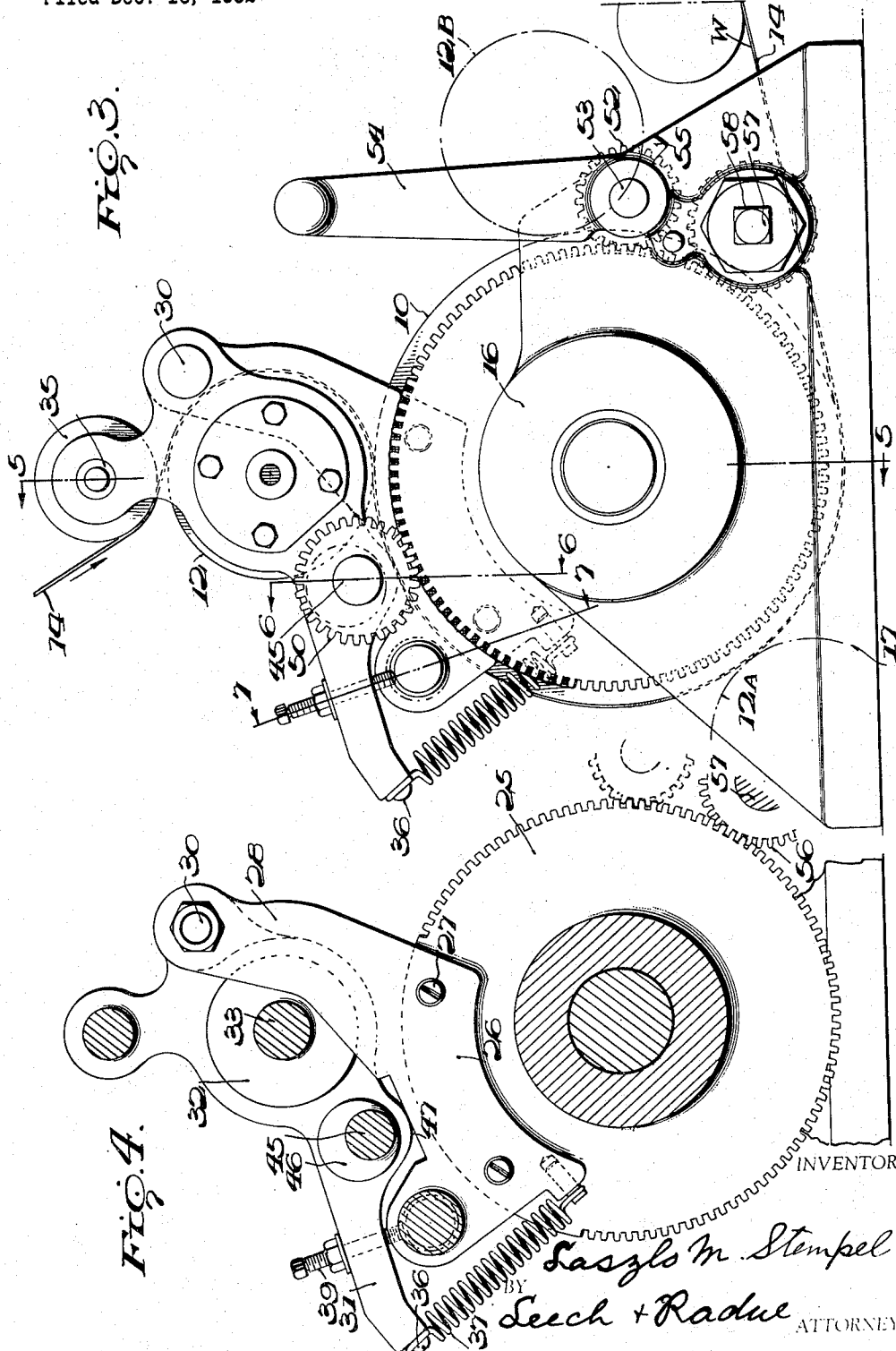


FIG. 4.

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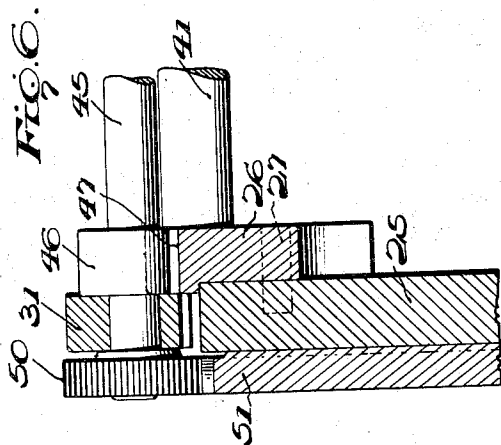
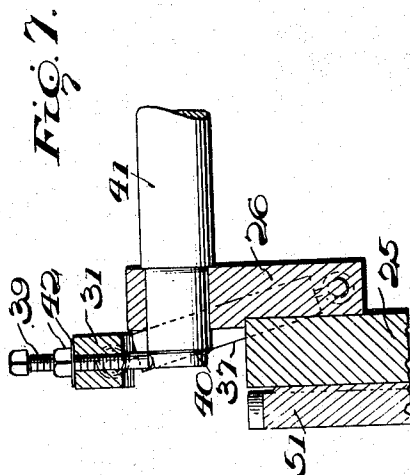
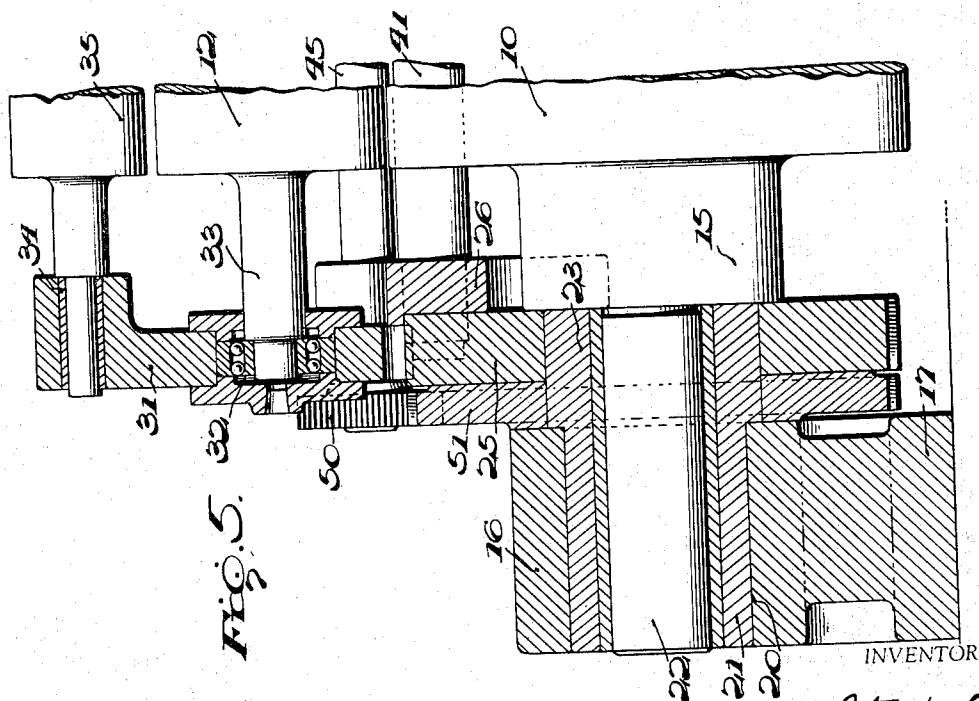
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3 Sheets-Sheet 3



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PAPER FEEDING MECHANISM

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8 Claims. (Cl. 271—2.3)

This invention relates to web feeding mechanism for use with web conversion machinery.

More particularly the invention relates to a mechanism for feeding continuous web-like material, such as paper, at the same uniform rate as and to conversion machinery such as multicolor printing presses and the like, and is especially directed to such apparatus adjustable to compensate for variation in feed rate resulting from difference in thickness of the web.

It is a general object of the present invention to provide a novel and improved web-feeding mechanism.

More particularly it is an object of the invention to provide in a web feeding mechanism means for rendering the rate of web delivery independent of its thickness, in a type of feeder mechanism wherein the web makes contact throughout a substantial arc with a feed roll driven synchronously with a correspondingly sized roll on conversion machinery.

An important object of the invention comprises the arrangement of a compression roll for contact with the feed roll and so mounted that it may be adjusted about the feed roll to regulate the degree of arcuate contact of the web therewith from a minimum of less than 90° to more than 270°, whereby the rate of delivery of the web may be regulated in accordance with its thickness.

An important feature of the invention resides in the apparatus for mounting and positioning the compression roll so that it may be moved circumferentially about the feed roll to determine the degree of arcuate contact of the web with the latter.

Another important feature of the invention resides in the means for supporting and biasing the compression roller together with apparatus for releasing the bias compression to facilitate the threading of the machine or to stop the feeding of web already in the machine.

Other and further objects and features of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specification, wherein is disclosed a single exemplary embodiment of the invention with the understanding that such changes and modifications may be made therein as fall within the scope of the appended claims without departing from the spirit of the invention.

In said drawings:

Fig. 1 is a front elevation of web feeding mechanism constructed in accordance with the present invention viewed from the web entering side;

Fig. 2 is a top plan view thereof;

Fig. 3 is a left end elevation of the mechanism on an enlarged scale showing the course of the web there-through and the range of possible adjustment;

Fig. 4 is a vertical section on an enlarged scale taken transversely through the web feeding roll on the plane of line 4—4 of Fig. 1;

Fig. 5 is a longitudinal fragmentary vertical section taken centrally through the paper feeding roll on the plane of line 5—5 of Fig. 3 looking in the direction of the arrows and showing but one of the ends of the ap-

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paratus, which are duplicate except for certain supplemental gearing;

Fig. 6 is a fragmentary longitudinal vertical section taken through the axis of the eccentric web release mechanism, on the plane of line 6—6 of Fig. 3 looking in the direction of the arrows; and

Fig. 7 is a fragmentary section on an inclined longitudinal plane, as shown by line 7—7 of Fig. 3.

In many cases web material must be fed to conversion or use machinery at the exact rate at which it is treated by the machinery in order that there be neither slack nor tension in the intervening web which might tend to cause it to slip in respect to conversion rolls. Nevertheless the web cannot be drawn from the large and heavy supply roll directly by the conversion machinery for obvious reasons, and some form of feeding mechanism must be provided. Conversion machinery is usually adapted for adjustment to operate on various thicknesses of web material and, paper for instance, may vary from one to ten or fifteen thousandths of an inch in thickness dependent upon its ultimate use.

It is the differences in thickness of paper for different purposes which provide the problem which the present apparatus solves. If web material is drawn between two driven contacting rolls of the same or similar diameters and makes substantially line contact with each, then the speed of feed of this material will be identical with the peripheral speed of the rolls. This form of feed is not entirely satisfactory where considerable tension is required to unwind the material from its original roll, nor is it entirely free from slippage possibilities and resort is usually made to substantial arcuate engagement of the web on at least one of the feed rolls. Depending on the extent of the arcuate contact, the rate of feed of the material delivered from this roll is not that of the arcuate or peripheral speed of the roll but is rather the speed or substantially that of the neutral axis of the material on the roll, which is, of course, moving on a larger radius than the periphery of the roller. The effective position of the neutral axis in respect to the roll periphery can be adjusted by varying the length of contact of the web material on the driving roll and with apparatus of the type about to be described the rate of feed of the paper or other web material can be maintained exactly the same whether its thickness is one or two thousandths or as much as ten or fifteen.

The apparatus of the present invention has been designed for use between a roll of printing paper or like material and a multi-color web fed printing press, but obviously only minor changes would be required to make the apparatus serve for many allied purposes.

Referring first to Fig. 3 for a general idea of the invention, it will be noted that the paper web 14 is advanced toward the right from any suitable source, such as a large roll or bundle, and passes arcuately about a portion of the periphery of the cylindrical rubber covered pressure roll 12, driven by contact, through the paper, from the metal feed roll 10 actuated by suitable gearing, not shown, acting through its main drive gear 11, Figs. 1 and 2, at the same peripheral speed as the printing cylinders.

After passing about the fixed arc of the pressure roll 12 determined by the guide roll 35 the paper is passed between this pressure roll and the larger diameter feed roll 10, passes about the selected arc of 10 and is fed off to the lower right for use, passing finally over the take-off guide roll of fixed position shown at the lower right in Fig. 3 above the W on the emerging web. This fixes the take-off position from feed roll 10. The degree of contact of the web with the feed roll 10 is regulated by changing the position of the pressure roll 12 from that of minimum arc, as indicated by the dotted line position 12a, through

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the solid line position, illustrated, to the maximum contact arc indicated by the dotted line position 12b for the compression roll. The compression roll may be adjusted and secured in any position throughout this range.

As seen in Figs. 1 and 2 the feed roll 10, has reduced ends 15 providing end play limiting shoulders, and further reduced spindles which act as journals mounted for rotation in bearing block units 16. The bases 17 of these bearing block units are adapted to be secured, in any desired manner, onto the frames of a printing or other web converting mechanism, as will be appreciated.

As seen in Fig. 5 each of the bearing blocks 16 is transversely bored at 20 to provide a press fit for the reduced end 21 of a bushing which receives the bearing sleeve for the journal 22 of the feed roll 10. The inner end of each bushing 21 is enlarged as at 23 to provide a cylindrical bearing surface for a disc or ring 25 which is rotatable thereon and is toothed for the major portion of its periphery as seen in Fig. 4.

Against the inner face of the untoothed portion of each of the discs 25 is mounted a bracket 26 by means of fastening screws 27 as seen in Fig. 4. A portion 28 of this bracket projects a considerable radial distance from the periphery of the disc and there receives the pivot pin 30 on which is fulcrumed one end of hanger 31, in the form of an irregularly shaped arm fitted near the fulcrum with anti-friction bearing 32 supporting the reduced end or spindle 33 of pressure roll 12. A boss on the hanger above this bearing is drilled to receive the bushing 34 to journal the reduced shaft of guide roll 35 which is mounted with its periphery a fixed distance from that of pressure roll 12 and provides for guiding the web portion 14 entering the pressure roll. It is in action principally when the pressure roll is somewhere intermediate the positions shown in solid lines and in dotted lines at 12a. The purpose of the guide roll 35 is principally to determine and fix the degree of contact of the web with the pressure roll periphery.

The remote end of each hanger has attached thereto by screw 36 a helical spring 37 of the tension type, the opposite end of which is secured by any suitable means, as shown, to the corresponding end of bracket 26 mounting the hanger. This spring serves to maintain the pressure roll in tight contact with the feed roll, but such pressure is adjustable by means of the stop screws 39, one passing through each hanger arm and having a rounded inner end for engaging in channel 40 in the protruding end of a connecting bar 41, the reduced ends of which pass through and are tightly fitted in openings in the brackets 26 to connect the two of them together. Each set screw 39 is provided with a head engageable by a suitable wrench and is also fitted with a washer and lock nut combination 42, as best seen in Fig. 7.

The two hangers are connected together not only by the rolls 12 and 35, but also by a transverse bar 45 passing through suitable openings in each hanger and rotatable therein. Mounted on this bar 45 and positioned above the corresponding flats 47 on the brackets 26 are a pair of eccentrics 46. As shown they are positioned with their low areas out of contact with the flats and so are ineffective, but when rotated one hundred and eighty degrees the high areas of the eccentrics engage the flats and lift the hangers jointly against the action of springs 37 so as to separate pressure roll 12 from feed roll 10 a sufficient distance to permit threading the web between them or to release a web already in position for any required adjustment or to stop its feed.

The transverse bar 45 may be directly fitted with a handle, not shown, for its manipulation, but as seen in the drawings it is more convenient to fit the left end thereof, Figs. 5 and 6, with a pinion 50 meshing with a gear 51 of approximately the same diameter as and mounted between the disc 25 and the left bearing block 16 on the enlarged portion 23 of the bushing 21. This gear is loosely mounted for rotation by engagement with

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pinion 52 carried by shaft 53 journaled in an appropriate boss in bearing block 16. This shaft has attached thereto a handle 54 for its manipulation which supports a lug 55 engageable with a stop pin to limit the degree of rotation of the handle. The amount of lift imparted to the hangers is kept insufficient to unmesh pinion 50 from gear 51 when the eccentric is at its maximum lift position.

Rotation of discs 25 which carry the brackets 26 and hence the pressure roll 12 is essential to change the position of the pressure roll and the extent of arcuate contact of the web with the feed roll. Such movement is achieved in unison by means of pinions 56 engaging the teeth at the peripheries of discs 25. These pinions 56 are secured to cross shaft 57, journaled at its two ends in suitable bosses in the bearing blocks, and extending to the left as seen in Fig. 1 beyond its boss where it is non-circular, as shown at 58, to receive a crank or the like, permitting it to be rotated the desired amount to adjust the position of the pressure roll and hence the degree of arcuate contact and rate of feed of the web.

It will be appreciated that when feeding a very thin paper the pressure roll will be adjusted to a position corresponding roughly to that indicated at 12b whereas when the paper is of extreme thickness the pressure roll will be adjusted to a position more nearly corresponding to that of 12a. For intermediate thicknesses of paper the adjustment will be found best somewhere between these two extremes. The purpose, of course, of these adjustments is to insure that one revolution of the feed roll feeds a length of paper exactly equivalent to its circumference, which is identical with that of the printing rolls, or related thereto in accordance with the drive ratio between them.

I claim:

1. Paper feeding apparatus of the type described including in combination, a large diameter feed roll, bearing blocks for said roll having concentric roll bearings and studs at the inner faces thereof, a disc journaled on each stud, a pressure roll for engagement with the feed roll, bearings for said pressure roll, a hanger fulcrumed to each disc and supporting one of said pressure roll bearings, resilient means biasing each hanger about its fulcrum to urge the rolls toward each other, and means to simultaneously adjust said discs about their stud bearings.

2. The apparatus of claim 1 in which said last mentioned means comprises arcuately disposed teeth on said discs, pinions engaging said teeth, a common shaft for said pinions journaled in said bearing blocks and means to rotate said shaft.

3. The apparatus of claim 1 in which eccentrics are provided to lift said hangers against said bias, and a common means to rotate eccentrics.

4. The apparatus of claim 3 in which said common means comprises a shaft connecting the eccentrics, a pinion on said shaft, a gear on one of said studs adjacent the disc thereon and meshing with said pinion and a connected pinion and crank for driving said gear.

5. Paper feeding apparatus of the type described including in combination, a large diameter feed roll, bearing blocks for said roll having concentric roll bearings and studs at the inner faces thereof, a disc journaled on each stud, a pressure roll for engagement with the feed roll, bearings for said pressure roll, a bracket secured to the inner face of each disc and extending radially beyond its edge, a hanger fulcrumed to each bracket on the disc side thereof at a point beyond the disc edge, each hanger carrying one of said pressure roll bearings near the fulcrum, a tension spring connecting the remote end of each hanger to its bracket to bias the tension roll against the feed roll, the edge of each disc circumferentially beyond the bracket being toothed, a shaft extending between said bearing blocks, pinions on said shaft engaging said disc teeth, means to rotate said shaft, a shaft extending between said hangers, an eccentric at each end of the shaft having a low spot normally clear of the edge of its bracket

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and a high spot elevated sufficiently to engage the bracket edge when the last mentioned shaft is rotated 180°, means to rotate said last mentioned shaft, stops to limit rotation to 180° and an adjustable stop screw extending through each hanger and engageable with a projection from the bracket to regulate to closeness of approach of the pressure roll to the feed roll.

6. Apparatus for feeding paper to conversion machinery at a rate independent of its thickness by regulating its extent of arcuate contact with a feed roll driven at substantially the same peripheral speed as a roll in said machinery comprising the combination of a hard surfaced feed roll, a resilient compression roll, means biasing said rolls together, means including a guide roll to deliver paper into contact with a major arc of the compression roll and between it and the feed roll, means having a fixed position to receive paper directly from said feed roll, means journalling and mounting said compression and guide rolls for adjustable movement about the periphery of the drive roll to change the extent of arcuate contact of the paper with the latter, said last mentioned means having a range such that the arc of contact may vary from the order of 45° to the order of 280° to accommodate pa-

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per substantially in the range of .01 to .15 inches thickness.

7. The apparatus of claim 6 in which adjustable stops are provided to limit the movement of said feed and compression rolls toward each other under the action of said bias means.

8. Paper feeding apparatus as defined in claim 6 in which bearings are provided for said compression roll, means mounting said bearings and journalled coaxially with said feed roll, and means to manually adjust said last mentioned means simultaneously to determine the orbital position of contact of the compression roll with the circumference of the feed roll.

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