June 27, 1967 J. J. BARTIZAL, JR 3,328,026

FORCE INDICATOR FOR ADJUSTABLE FOLDING ROLLER

Filed March 15, 1965 2 Sheets-Sheet 1

Fig. 1.

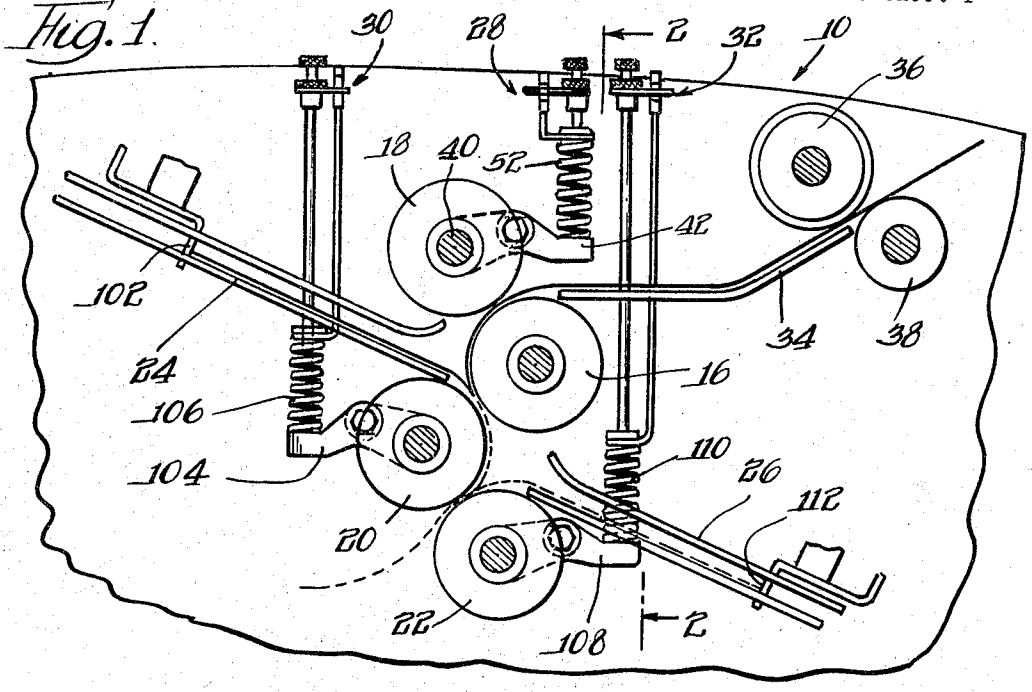
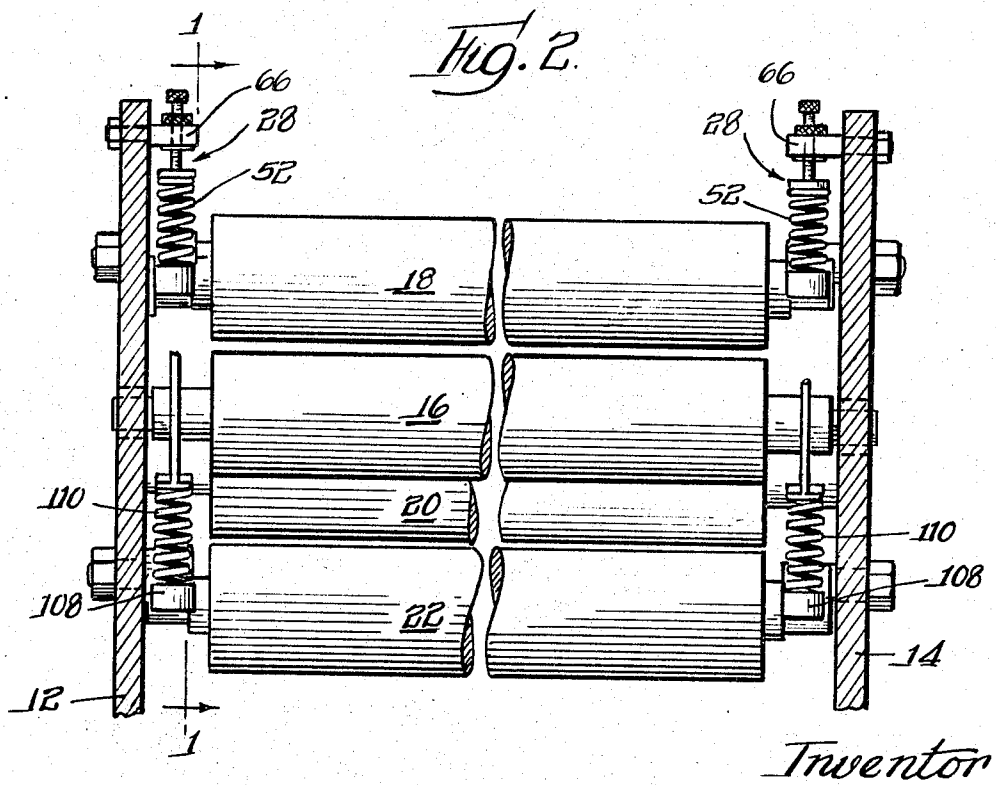


Fig. 2.



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Fig. 3.

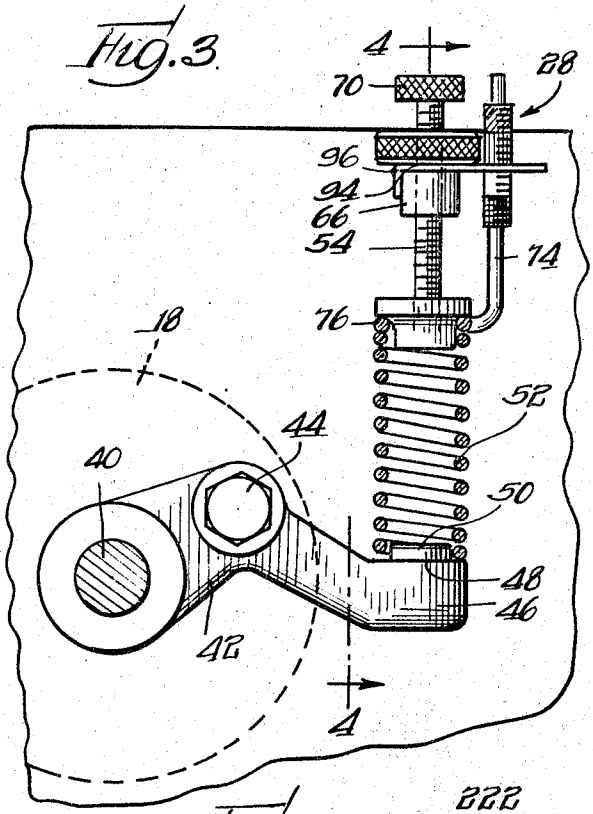


Fig. 4.

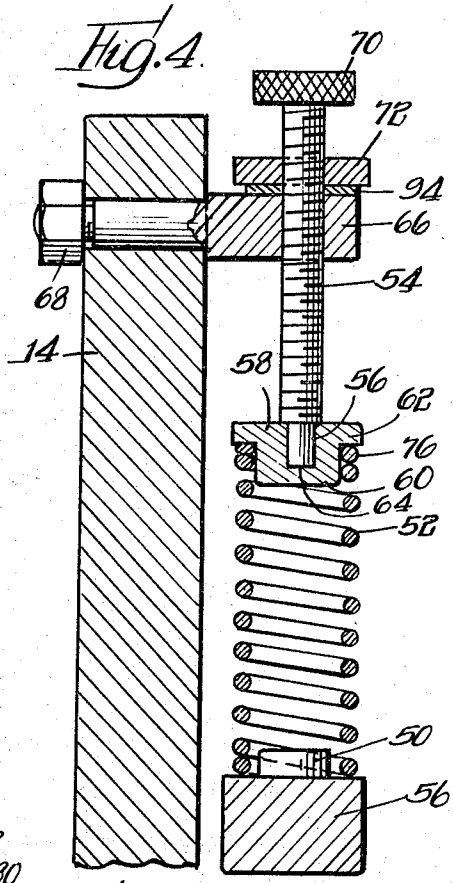


Fig. 5.

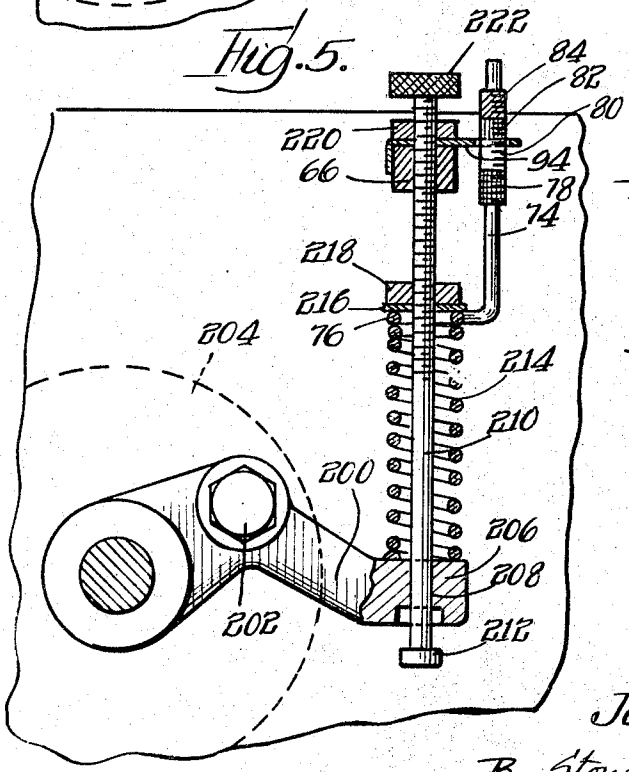
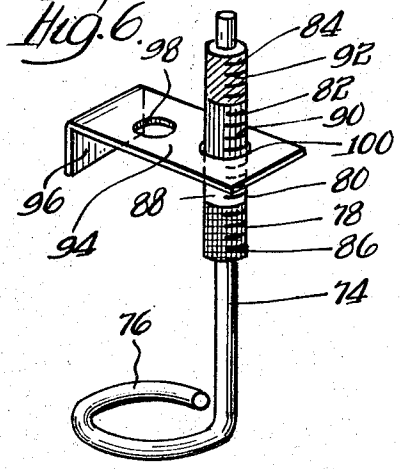


Fig. 6.



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United States Patent Office 3,328,026
Patented June 27, 1967

3,328,026

FORCE INDICATOR FOR ADJUSTABLE FOLDING ROLLER

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Filed Mar. 15, 1965, Ser. No. 439,735
10 Claims. (Cl. 270—68)

This invention relates to a folding machine and more particularly to that type of folding machine which folds paper at one or more places and in which the paper is of one or more sheets or layers.

In the printing industry, printed material is ordinarily printed in flat sheets, and then the sheets are folded and the sheets may be then cut or bound. There are machines provided for the folding of printed sheets. It is evident that the folding machines must fold and form a crease in the paper at a preselected position, and this position must be repeated with each sheet. Although the need is greater in certain jobs than in others, it is evident that, for instance, should a piece of printing material be so arranged that a photograph extends from one page to the other; and in the printing of the flat sheet, the photograph is not on abutting panels, but the final product has the photograph on adjacent pages, the photograph must mate. It is not desirable to have printing from another page extending into the middle of the photograph. Although the operation of folding machines is well known in the art, that is, a sheet of paper passes between a pair of rollers and is stopped to form a buckle at a prescribed location, and the buckled paper is rolled to form a crease in the paper. A folding machine has its rollers adjusted for each job so that the fold and the buckle occurs at a precise place, and the crease is made in the exact location that is required rather than folding the paper so that printing is missed or photographs do not meet. The setting up of the folding machines is an art rather than a precise mathematical science. The folding machines are adjusted with the pressures on the various rollers varied in order to get the correct folding. At the beginning of each job which goes through a folding machine, the artisan who adjusts the folding machine may take five hours to adjust a folding machine to its proper operation. Obviously, the folding machine is not operating to fold paper in production during this time, and a certain amount of printed material is lost due to experimentation in setting up the folding machines.

At the present time, there are two principal manufacturers of folding machines. Both of the manufacturers have machines which are built on the same general principle and, that is, that springs constantly urge adjacent rollers toward each other to apply the requisite pressure between the rollers to obtain an appropriate fold. With both of these machines, the artisan who sets up the machine spends a considerable time in setting up the machine. One of the aspects of a printing business is that the repetition of a given job generally provides a source of higher profits. Currently, there is one part of a repeat job which is not any more profitable than a new job is, and that is in the folding of the printed sheets. This is due to the fact that the folding machine must be adjusted for each job, and a job which is identical to a job which went through a month before is not any easier to set up than one which has never been through before. It is a principal object of the present invention to provide an improvement in the construction of paper folding machines wherein it is possible to reduce the time required to set up a folding machine for a repeat job by providing an indicator at each end of each movable roller in the folding machine, so that each job the adjustment of the rollers may be noted and recorded thereby providing an artisan with a starting point for the adjustment of the movable rollers in the folding machine to reduce the setting up time at least fifty percent.

It is another object of the herein disclosed invention to provide an indicator for use in a paper folding machine which indicator is capable of being attached to an existing paper folding machine.

It is a further object of the present invention to provide an improved construction for a paper folding machine in which an indicator is connected to each end of each of the movable rollers of the machine, and which indicator may be readily and conveniently observed to determine the force applied between the adjacent rollers which have paper passing between them.

Other objects and uses of this invention will become readily apparent to those skilled in the art upon a perusal of the following specification in light of the accompanying drawings in which:

FIGURE 1 is an end view of a section of a paper folding machine in which an indicator is shown connected to one end of each of the movable rollers of the sections thereby illustrating the instant invention;

FIGURE 2 is a cross sectional view taken on line 2—2 of FIGURE 1 with certain parts broken away in order to show the construction of certain indicators;

FIGURE 3 is an enlarged end view of one of the indicators shown in FIGURES 1 and 2 in order to show better the construction of the indicator;

FIGURE 4 is a cross sectional view taken on line 4—4 of FIGURE 3;

FIGURE 5 is an end view of an indicator identical to that shown in FIGURE 3, but shown attached to a roller in which a spring rod is connected directly to a pivot arm; and

FIGURE 6 is a perspective view of an indicator rod with four colored sleeves fixed thereto mateably cooperating with an indicator plate.

Referring now to the drawing and especially to FIGURE 1, a section of a folding machine generally indicated by numeral **10** is shown therein. The section of the folding machine generally includes a pair of side panels **12** and **14** which constitute a portion of a frame, a stationary roller **16** rotatably mounted in the frame, three movable rollers **18**, **20**, and **22** pivotally and rotatably mounted in the frame, a stop assembly **24** and a second stop assembly **26** mounted on the frame adjacent to the rollers, and spring rod and indicator assemblies **28**, **30**, and **32** connected to movable rollers **18**, **20**, and **22**, respectively, and to the frame.

As is conventional in the construction of paper folding machines, a guide **34** is mounted between the side panels **12** and **14**. A pair of entrance rollers **36** and **38** drive the paper along the guide **34** toward the elongated rollers **16** and **18**.

The roller **18** has a roller shaft **40** fixed thereto which roller shaft is connected to a conventional drive which is not shown herein, but is well known in the art. The opposite ends of the roller shaft are rotatably mounted in pivot arms, one of which may be best seen in FIGURE 3. One end of the roller **18** is rotatably mounted in a pivot arm **42** and the other end of the roller is mounted in a similar arm. The pivot arm **42** is mounted pivotally on a bolt **44** which acts as a pivot pin for the pivot arm, and bolt **44** is fixed to the side panel **14** so that the pivot arm is pivotally connected to the frame as is evident in FIGURE 3. The roller **18** has one end rotatably mounted in one end of the arm and at the other end of the arm there is a spring receptacle portion **46** which includes a spring surface **48** with a boss **50** formed integral therewith. A compression coil spring **52** is mounted on the spring receptacle portion **46**. It may be seen that one end of the spring engages the spring surface **48** and the coils of the spring

surround the boss 50, so that the spring is held onto the receptacle portion 46. A spring rod 54 is connected to the other end of the spring 52. Spring rod 54 has a shank 56 formed integral with one end. A spring retainer 58 which has a reduced portion 60 is positioned within the spring 52, and a flange 62 formed integral with the reduced portion is held in engagement with one end of the spring. The spring retainer has a rod aperture 64 in its central portion which rotatably receives the shank 56. A rod ear 66 is fixed to the side panel 14 by a nut 68 and the spring rod 54 is threadedly mounted in the ear 66. The spring rod has a knurled knob 70 formed integral with its opposite end, and a lock nut 72 threadedly engages the rod 54 between the knob 70 and the ear 66. It may be seen that by rotating the rod 54 in an appropriate direction, the compression on spring 52 may be adjusted, and the lock nut 72 serves to hold the rod in a selected attitude.

The spring rod and indicator assembly 28 includes an indicator rod 74. The indicator rod 74, which is best seen in FIGURE 6, includes a loop 76 formed integral therewith, which loop mates with the reduced portion 60 of the spring retainer. The rod has four colored cylindrical sleeves 78, 80, 82, and 84 adhesively secured to the rod adjacent to the end opposite the end having the loop. The sleeve 78 is black and has a plurality of lines 86 inscribed thereon to provide a marking indicia. The sleeve 80 is white and also has a plurality of lines 88 inscribed thereon. The sleeve 82 is red and has a plurality of lines 90 inscribed thereon, while sleeve 84 is brown and has a plurality of lines 92 inscribed thereon. The sleeves provide an indicia for the indicator rod and are cooperative with an indicator plate 94. The indicator plate 94 is substantially flat and has a stop 96 formed integral with one end thereof which stop is substantially perpendicular to the plate. The indicator plate has a pair of apertures 98 and 100 formed therein. The aperture 100 mateably receives the rod with its plurality of sleeves as will be described hereinafter. The indicator plate is positioned on the ear 66 with the stop 96 abutting the ear and the spring rod 54 passing through the aperture 98. The lock nut 72 performs a dual function of holding the indicator plate in position and locking the threaded rod in its selecting position. It is evident that as the rod 54 is moved relative to ear 66 to adjust the compression of spring 52, the amount of adjustment or disposition of the spring relative to the frame is indicated by the cooperation of the plurality of sleeves on the indicator rod and the indicator plate.

The roller 18 is positioned adjacent to the stationary roller 16, and the end of guide 34 extends to a position adjacent to the bite between the rollers 16 and 18. On the other side of the rollers 16 and 18 there is positioned the stop assembly 24. The construction of the stop assembly 24 is well known in the art and will not be described in detail herein other than to point out that the stop assembly 24 includes an adjustable stop 102 which engages paper which has passed through the bite between rollers 16 and 18.

The roller 20 is positioned adjacent to stationary roller 16. The roller 20 is also driven by a conventional well known power source which is not described in detail herein. The roller 20 has both ends rotatably and pivotally mounted on pivot arms, one of which is shown and is pivot arm 104 which pivot arm is substantially identical in construction to pivot arm 42 which was described in detail above. The pivot arm 104 is connected to a spring rod and indicator assembly 30 which is substantially identical to the spring rod and indicator assembly 28 which was described in detail above. The difference between the two assemblies is that the rods are longer in order to provide an added convenience for adjusting the compression on a spring 106 which is connected to pivot arm 104.

Positioned adjacent to the roller 20 is the roller 22 so that there is a bite between the rollers 20 and 22. The roller 20 is also pivotally connected to a pair of pivot arms one of which is pivot arm 108 which arm is connected to a compression spring 110. The compression spring 110 is connected to spring rod and indicator assembly 32 which is used to determine the force applied between the bite of the movable rollers 20 and 22.

The stop assembly 26 is positioned adjacent to the outlet of the bite between rollers 16 and 20 to receive paper which leaves those two rollers. The stop assembly includes a conventional stop 112 inasmuch as the construction of stop assembly 26 is well known, no description is made of the stop assembly herein.

In the operation of the section of the instant folding machine, the machine during its operation operates as a conventional folding machine, that is, a sheet of paper passes between rollers 36 and 38 to the bite between rollers 16 and 18. The rollers 16 and 18 drive paper into the stop assembly 24 until the paper engages stop 102. The paper then buckles to form a fold which fold is then driven between rollers 16 and 18 thereby creasing the paper, removing the paper from the stop assembly and driving the folded sheet to the stop assembly 26 where the paper engages stop 112 at its creased portion. The paper buckles again and a fold is formed and the folded portion passes between rollers 20 and 22 to be creased and removed from the stop assembly. This particular aspect of the invention is old and well known.

In order to achieve proper buckling and creasing of the paper, the pressure between the rollers must be adjusted to a given amount which amount is determined for each job by trial and error. There must be a desired pressure across the bite of the rollers. In the operation of adjusting the pressure between the rollers, the lock nuts 72 are loosened and the knobs 70 are either raised or lowered to reduce or increase the compression of the spring 52. The folding operation is observed to determine whether there is proper folding occurring. Once the machine is adjusted to a proper setting whereby proper folding occurs, the machine may operate continually except for minor adjustments which must be made to maintain the machine in adjustment. With the machine in proper adjustment for a given job, the artisan who adjusts the machine may then observe the position of each of the springs on each of the movable rollers. He then may note at which mark and for each color the spring is adjusted in relation to the indicator plate. He then makes a notation for the setting of each end of each roller on a card. The card bearing the appropriate notations may then be filed. When the same job comes through the plant again, the artisan who adjusts the machine then need only refer to said card to set the initial adjustment for the rollers. For instance, one end of the roller 18 may be adjusted to the first mark of the red and the other end may be adjusted to the top mark of the white, the artisan thus has a means for starting his adjustments thereby reducing the amount of time necessary for making the adjustment of the machine.

In looking now to FIGURE 5, it may be seen that the present invention may be utilized in a construction of a machine wherein a spring rod is connected to the pivot arm. A pivot arm 200 is shown in FIGURE 5 mounted on a pivot pin 202. A roller 204 which is identical in construction to the other movable rollers 18, 20, and 22 is rotatably mounted in pivot arm 200. The pivot arm 200 has a spring receptacle portion 206 which includes an aperture 208. A spring rod 210 extends through the aperture 208 and has a head 212 to hold the rod in connection with the pivot arm. A compression coil spring 214 is positioned with one end in engagement with the spring portion 206 and the rod 210 extends through the center of the spring. The indicator rod 74 has its loop 76 in engagement with the upper end of the coil spring. A spring plate 216 is positioned in engagement with the indicator rod and a spring lock nut 218 is threadedly mounted on rod 210 and is in engagement with the plate 216. The rod 210 is threadedly mounted in ear 66 with the indicator plate 94 in engagement with the ear. A rod lock nut 220 holds the plate in engagement with the ear as does lock

nut 72 which was described above. The spring rod 210 has a knob 222 at its upper end for a convenient means for manipulating spring rod 210.

It may be appreciated in that the construction shown in FIGURE 5, the device operates somewhat differently in that the position of the spring lock nut 218 along the spring rod determines the disposition of the spring 214 relative to the ear 66. However, the indicator rod 74 cooperates with the indicator plate 94 in the same manner as was discussed above.

In view of the foregoing description, it is readily apparent that a folding machine may be adjusted for a particular job by an artisan and when the proper adjustment is attained, the attitude of the various springs at each end of each of the rollers is noted and recorded so that when it is necessary to do the same job again, the machine may be placed in the same adjustment with a minimum of effort thereby reducing the set up time a substantial amount.

Although a specific embodiment of the herein disclosed invention has been shown and described herein, it is readily apparent that those skilled in the art may make various modifications and changes without departing from the spirit and scope of the present invention. It should be noted that four specific colors were shown as indicators, it is noted that different colors may be used without departing from the instant invention. It is to be expressly understood that the present invention is limited only by the appended claims.

What is claimed is:

1. In a paper folding machine, the combination, comprising, a plurality of elongated rollers, each of said rollers positioned adjacent to at least another roller to receive paper therebetween and to drive said paper, a frame, a stop assembly mounted on said frame and positioned adjacent to a pair of said rollers to stop paper driven by said rollers to form a buckle in the paper, said plurality of elongated rollers including a plurality of movable rollers, a pivot arm rotatably connected to each end of each of said movable rollers, each of said pivot arms being pivotally connected to the frame, a spring connected to each of said pivot arms urging the respective end of the movable roller toward an adjacent roller, an indicator connected to each of the springs, and a fixed pointer cooperative with each of the indicators and being connected to the frame for indicating displacement of the spring relative to the frame.

2. In a paper folding machine, the combination, comprising, a plurality of elongated rollers, each of said rollers having a driving surface for engaging paper to move the paper relative to the roller, each of said rollers positioned adjacent to at least another roller to receive paper therebetween and to drive said paper, a frame, a stop assembly mounted on said frame and positioned adjacent to a pair of said rollers to stop paper to form a buckle in the paper which buckled paper is driven between a pair of the rollers to crease the paper, said plurality of elongated rollers including a plurality of movable rollers, a pivot arm rotatably connected to each end of each of said movable rollers, each of said pivot arms being pivotally connected to the frame, a plurality of rod ears fixed to the frame, a spring rod connected to each of said rod ears, a spring connected to each of the pivot arms and to a respective spring rod urging the respective end of the movable roller toward an adjacent roller, an indicator connected to each of the springs, and a fixed pointer cooperative with each of the indicators and being connected to the frame for indicating displacement of the respective spring relative to the frame.

3. In a paper folding machine, the combination, comprising, a frame, a stationary roller rotatably mounted on the frame, a plurality of elongated movable rollers rotatably connected to the frame, each of the rollers positioned adjacent to at least another roller to receive paper therebetween and to drive said paper, a stop assembly mounted on said frame and positioned adjacent to a pair of said rollers to stop paper to form a buckle in paper which buckled paper is driven between a pair of rollers to crease the paper, a pivot arm rotatably connected to each end of each of said movable rollers, each of said pivot arms being pivotally connected to the frame, a plurality of rod ears equal in number to the number of ends of said movable rollers fixed to the frame, a spring rod fixed to each of the pivot arms and connected to a rod ear, a spring connected to each of the pivot arms and to a spring rod to urge the respective end of the respective movable roller toward an adjacent roller, an indicator connected to each of the springs, and a fixed pointer cooperative with each of the indicators and being connected to the frame for indicating displacement of the spring relative to the frame.

4. In a paper folding machine, the combination, comprising, a plurality of elongated rollers each of said rollers having a driving surface for engaging paper to drive said paper, each of said rollers positioned adjacent to at least another roller to receive paper therebetween and to drive said paper between the rollers, a frame, a stop assembly mounted on said frame and positioned adjacent to a pair of said rollers to stop paper to form a buckle in the paper which buckled paper is driven between a second pair of rollers to crease the paper, said plurality of elongated rollers including a plurality of movable rollers, a pivot arm rotatably connected to each end of each of said movable rollers, each of said pivot arms being pivotally connected to the frame, a spring connected to each of the pivot arms urging the respective end of the movable roller toward an adjacent roller, an indicator rod connected to one end of each of the springs, indicia on each of the indicator rods, and a fixed pointer cooperative with the indicia of each of the indicator rods and being connected to the frame for indicating the displacement of the spring relative to the frame.

5. In a paper folding machine, the combination, comprising, a frame, a plurality of elongated rollers rotatably connected to the frame, each of the rollers having a driving surface for engaging paper to drive said paper relative to the rollers, each of said rollers positioned adjacent to at least another roller to receive paper therebetween, a stop assembly mounted on said frame and positioned adjacent to a pair of said rollers to stop paper to form a buckle in the paper which buckled paper is driven between a second pair of rollers to crease the paper, said plurality of elongated rollers including a plurality of movable rollers, a pivot arm rotatably connected to each end of each of said movable rollers, each of said pivot arms being pivotally connected to the frame, a plurality of rod ears equal in number to the number of ends of said movable rollers fixed to the frame, a spring rod connected to each of said rod ears, a spring connected to each of said pivot arms and to a spring rod urging the respective end of the movable roller toward an adjacent roller, an indicator rod connected to each of the springs, each of said indicator rods having indicia thereon, and a fixed pointer cooperative with each of the indicia and being connected to the frame for indicating displacement of spring relative to the frame and the force between adjacent rollers is indicated by cooperation of the fixed pointer and indicia associated with the respective adjacent rollers.

6. In a paper folding machine, the combination, comprising, a frame, a plurality of elongated rollers rotatably connected to the frame, each of said rollers positioned adjacent to at least another roller to receive paper therebetween and to drive said paper, a stop assembly mounted on said frame and positioned adjacent to a pair of said rollers to stop paper driven by said rollers to form a buckle in the paper which buckled paper is driven by a second pair of rollers to crease paper, said plurality of elongated rollers including a plurality of movable rollers, a pivot arm rotatably connected to each end of each of said movable rollers, each of said pivot arms being pivotally con-

nected to the frame, a plurality of rod ears fixed to the frame, a spring rod connected to each of the rod ears, a spring connected to each of the pivot arms and to a respective spring rod urging the respective end of the movable rollers toward an adjacent roller, an indicator rod connected to each of the springs, a plurality of sleeves fixed to each of the indicator rods, each of said sleeves being a different color than the adjacent sleeves, and a fixed pointer cooperative with each of the pluralities of sleeves and being connected to the frame for indicating the displacement of the spring relative to the frame.

7. In a paper folding machine, the combination, comprising, a frame, a plurality of elongated rollers rotatably connected to said frame, each of said rollers positioned adjacent to at least another roller to receive paper therebetween and to drive said paper, a stop assembly mounted on said frame and positioned adjacent to a pair of rollers to stop paper to form a buckle in said paper which buckled paper is driven between a second pair of rollers to crease the paper, said plurality of elongated rollers including a plurality of movable rollers, a pivot arm rotatably connected to each end of each of said movable rollers, each of said pivot arms being pivotally connected to the frame, a plurality of rod ears fixed to the frame, a spring rod connected to each of said rod ears, a spring connected to each of the pivot arms and to a respective spring rod urging the respective end of the movable roller toward an adjacent roller, an indicator rod connected to each of the springs, a plurality of sleeves fixed to each of the indicator rods, each of said sleeves being a different color, each of said indicator rods mating with an aperture in a flat indicator plate, each of said flat indicator plates fixed to an ear and cooperative with the sleeves of the respective indicator rod for indicating the displacement of the spring relative to the frame, and the force applied between adjacent rollers is indicated by cooperation of the sleeves and plates associated with the respective adjacent rollers.

8. In a paper folding machine, the combination, comprising, a plurality of elongated rollers, each of said rollers positioned adjacent to at least another roller to receive paper therebetween and to drive said paper, a frame, a stop assembly mounted on said frame and positioned adjacent to a pair of said rollers to stop paper to form a buckle in the paper which buckled paper is driven between a second set of rollers to crease the paper, said plurality of elongated rollers including a plurality of movable rollers, a pivot arm rotatably connected to each end of each of said movable rollers, each of said pivot arms pivotally mounted on the frame, a spring connected to each of the pivot arms urging the respective end of the movable roller toward the adjacent roller, an indicator rod connected to each of the springs, a plurality of sleeves fixed to each of the indicator rods, each of said sleeves being a different color than the adjacent sleeves, and each indicator rod movably mounted in a flat indicator plate having an aperture for movably receiving the plurality of sleeves to cooperate with said sleeves, each of said flat indicator plates fixed to the frame, whereby each plurality of sleeves cooperates with its respective indicator plate for indicating the displacement of the respective spring relative to the frame.

9. In a paper folding machine, the combination, comprising, a frame, a plurality of elongated rollers rotatably mounted on the frame, each of said rollers positioned adjacent to at least another roller to receive paper therebetween and to drive said paper, a stop assembly mounted on said frame and positioned adjacent to a pair of said rollers to stop paper driven by said rollers to form a buckle in the paper, said plurality of elongated rollers including a plurality of movable rollers, a pivot arm rotatably connected to each end of each of said movable rollers, each of said pivot arms being pivotally connected to the frame, resilient means connected to each of the pivot arms urging the respective end of the movable roller toward an adjacent roller, an indicator rod connected to one end of each of the resilient means, a plurality of sleeves fixed to each of the indicator rods, and a fixed pointer cooperative with each of the plurality of sleeves and being connected to the frame for indicating the attitude of the resilient means relative to the frame.

10. In a paper folding machine, the combination, comprising, a frame, a stationary roller rotatably mounted on said frame, a plurality of elongated movable rollers rotatably mounted on said frame, each of said movable rollers and the stationary roller positioned adjacent to at least another roller to receive paper therebetween and to drive said paper, a stop assembly mounted on said frame and positioned adjacent to a pair of the rollers to stop the paper to form a buckle in the paper which buckled paper is driven between a second pair of rollers to crease the paper, a pivot arm rotatably connected to each end of each of said movable rollers, each of said pivot arms being pivotally connected to the frame, a plurality of rod ears equal in number to the number of ends of said movable rollers fixed to the frame, a spring rod threadedly mounted in each of said rod ears, a lock nut threadedly mounted on each of the spring rods for locking the spring rod relative to the rod ear, a compression coil spring connected at one end to each of the pivot arms and at the other end to a respective spring rod for urging the respective end of the movable roller toward an adjacent roller, an indicator rod connected to the end of each of the springs and having one end adjacent to its respective rod ear, a plurality of abutting cylindrical sleeves fixed to each of the indicator rods, each of said sleeves being a different color than the adjacent sleeves, indicia inscribed on each of the sleeves, a flat indicator plate held on to each of the rod ears by the lock nut and having an aperture for matably receiving the sleeves of the respective indicator rod, whereby the disposition of the compression spring relative to the frame is indicated by the cooperation of the flat indicator plate and the sleeves to indicate the force applied between adjacent rollers.

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