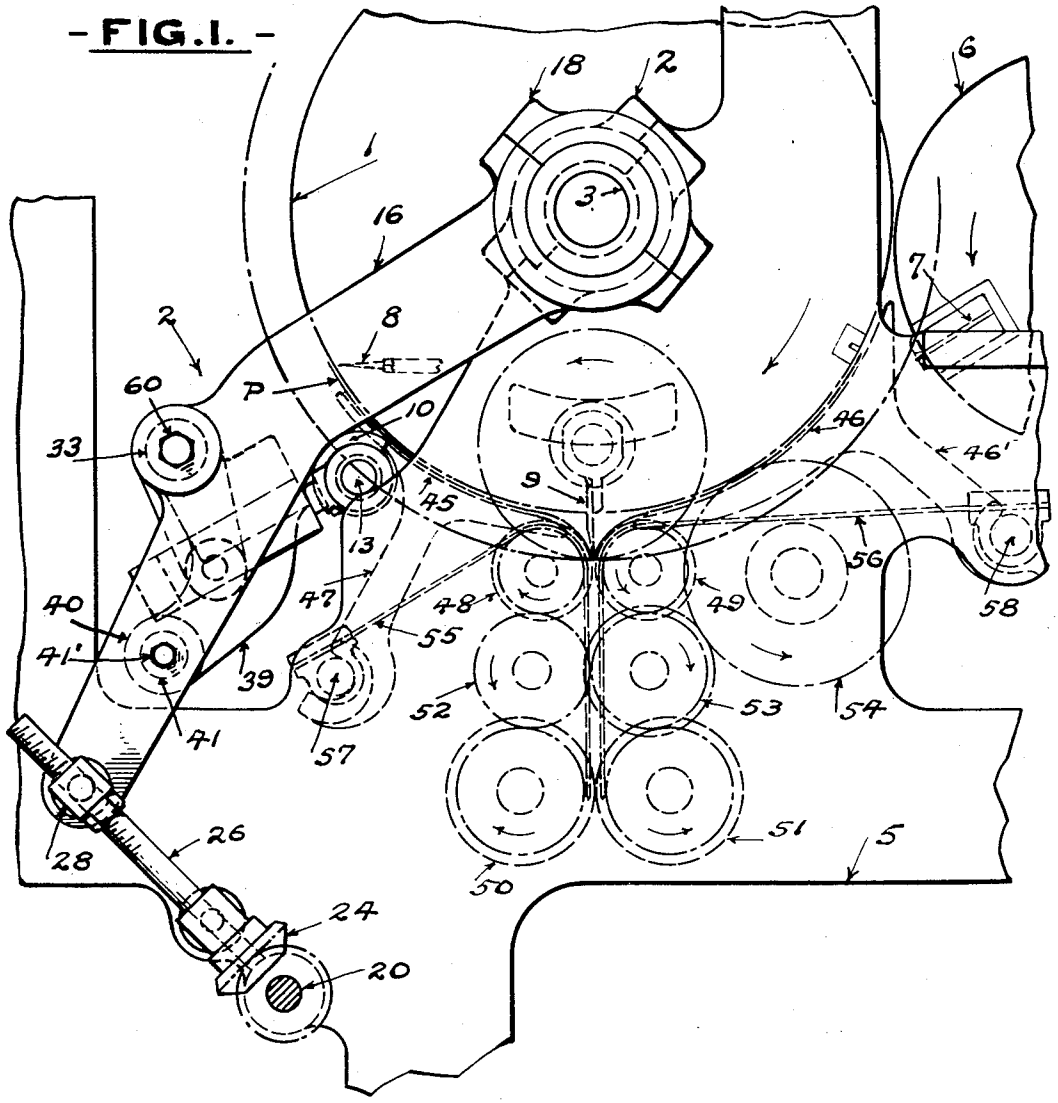
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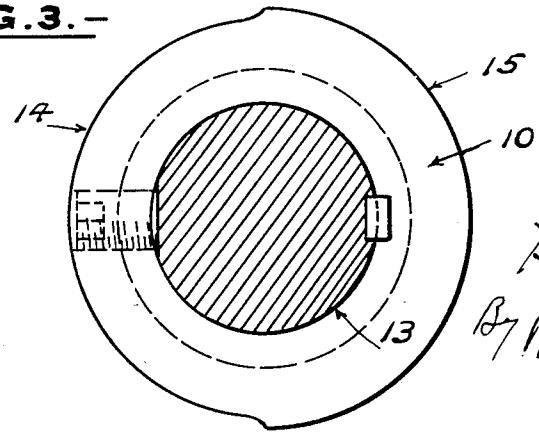
FOLDING MECHANISM

Filed Oct. 31, 1931 2 Sheets-Sheet 1

-FIG.1.-




-FIG.3.-




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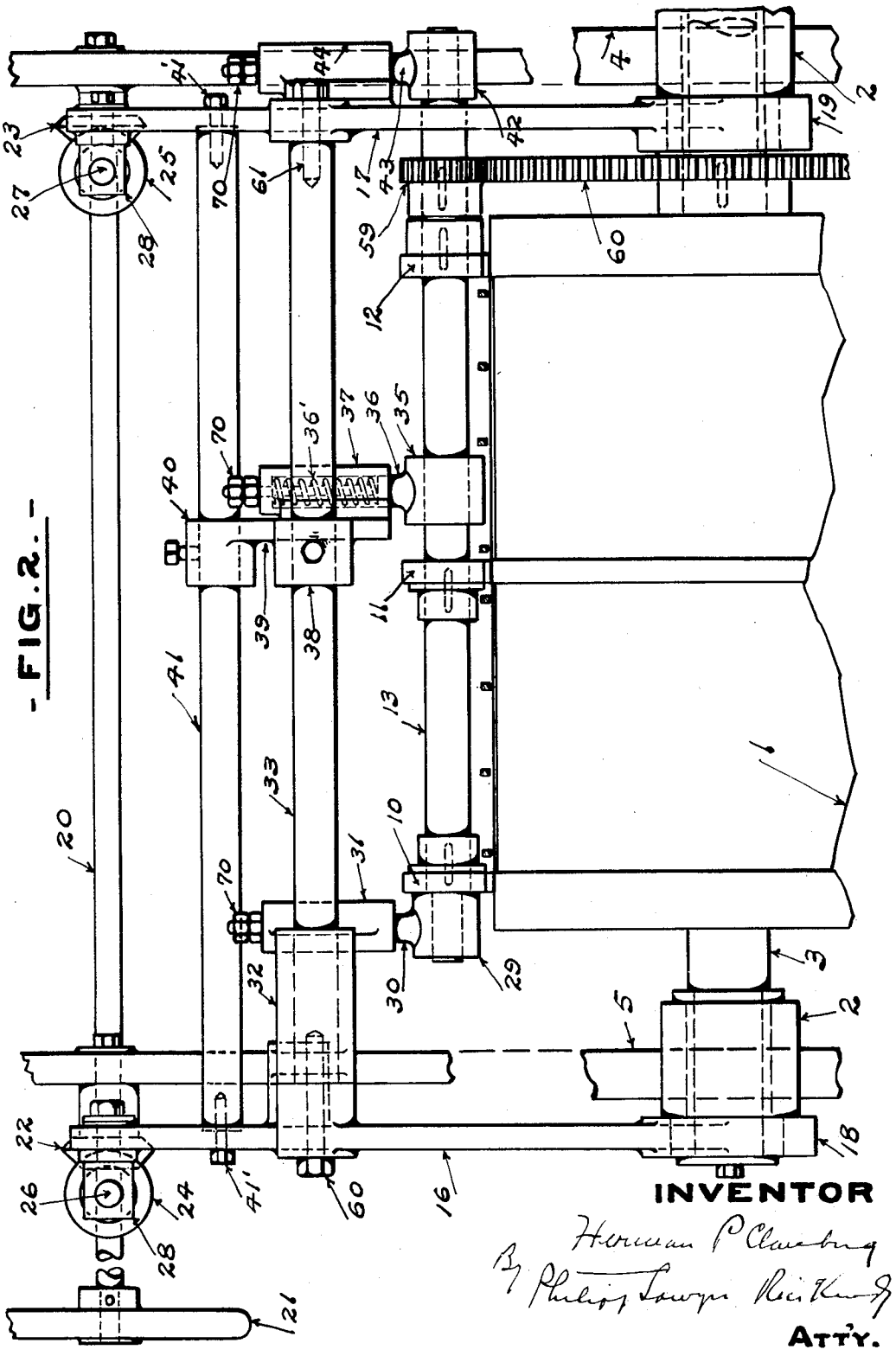


FIG. 2.

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1,937,510

## FOLDING MECHANISM

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Application October 31, 1931. Serial No. 572,301

14 Claims. (Cl. 270—76)

This invention relates to certain improvements in folding cylinders, particularly folding cylinders used in high speed printing machines.

The rotary folders used in conjunction with high speed printing machines usually include a cylinder provided with a tucking blade which folds off the product into the bite of a pair of cooperating folding rolls, and this class of folding cylinders is provided with sheet taking devices, such as pins or grippers, which take the leading end of the web or associated webs and carry it partly or wholly around the folding cylinder, a cooperating cutting mechanism generally being employed for cutting the sheets from the web.

After the sheet or product has been carried to a certain point in the revolution of the folding cylinder, the sheet is released from the pins or other sheet taking devices and the tucking blade tucks off the sheet into the folding off rolls. It frequently happens that after the product has been released by the pins or grippers and before it has been tucked into the bite of the folding rolls a slip of the sheet on the cylinder takes place, this slip varying with the speed at which the cylinder is rotated when the press is operating at any speed less than the regular running speed, so that the fold does not come at the right point in the sheet, that is, in accelerating or decelerating the press a certain number of products are improperly folded, that is, the fold line does not occur in the proper place. This is further effected by variation in the tension on the web roll, and at high speeds there is a tendency for the sheets to slide ahead so as to bring the fold nearer the trailing end of the product, and at low speeds nearer the leading end.

Certain constructions which are effective for the purpose for which they were designed have been proposed for overcoming this tendency of the product to slip, either forward or backward, after it has been released by the sheet taking devices, such constructions embodying resilient devices for engaging the product and holding it against the folding cylinder so that it cannot slip. In modern high speed machines, however, where there is apt to be variation in the press speed or in the web tension which would cause an irregular feed of the products to the folder, it is very desirable that means be provided whereby the devices employed for holding the product against the cylinder may be adjusted to nicety while the press is running, this being particularly true in the production of products in which a very narrow margin space is left outside the printed matter, such, for instance, as a telephone book or the like, this being particularly important in accelerating or decelerating the press. A sequence of steps in the operation of a machine employing mechanism of a general character analogous to applicant's is shown in Figures 3 to 6 of patent to Halliwell No. 1,499,106 dated June 24, 1924 for Folding cylinders, it being understood that a timed relationship or a practically similar sequence of steps takes place in applicant's device between the sheet taking means and the folding off means as well as the means for holding the sheet after it has been released by the pins of the folding cylinder.

It is therefore the especial object of the present invention to provide an improved construction for holding the product against the cylinder after it has been released by the sheet taking devices, so that no matter what the speed of the cylinder may be a slip of the product relatively to the folding off blades is prevented and the fold line occurs in the proper position relatively to the printed matter on the product, so that during acceleration or deceleration of the press the fold occurs in the right position and no products are lost because of improper folding, the mechanism being such as to be adjustable to a nicety while the press is running.

A further object of the invention is to provide a mechanism of improved construction in which the holding means are rigidly mounted so as to securely hold the product against the folding cylinder, and a construction which will be of simple form and easily accessible for adjustment by the press operator.

With these and other objects not specifically referred to in view, the invention consists in certain novel parts, arrangements and combinations which will be fully described in connection with the accompanying drawings and the novel features pointed out in the claims hereunto annexed.

In these drawings,—

Figure 1 is an end elevation, partly broken away and partly in section, of the improved mechanism for effecting the objects of the invention;

Figure 2 is a side and top view of part of the construction shown in Figure 1 looking in the direction of arrow 2 of that figure, certain parts of the construction being broken away, and

Figure 3 is a sectional view, on an enlarged scale, of one of the rolls employed for holding the product against the cylinder.

Referring now to these drawings, the machine

selected to illustrate the invention is a folding cylinder 1 supported in bearings 2 by a shaft 3, the bearings being supported in side frames 4, 5, of any suitable or desirable construction, this cylinder being driven in any suitable manner, not illustrated. Cooperating with this cylinder is a cutting cylinder 6, of any suitable or desirable construction, the cutting mechanism being of the usual type, indicated at 7. In the particular folding cylinder shown, the sheet taking devices are in the form of pins 8, which take the leading end of a product P and carry it around the cylinder. While pins have been shown as the sheet taking devices employed, it will be understood that the construction is not to be limited to such pins, but any suitable gripper mechanism may be employed for this purpose. The product is folded off from this cylinder by the usual tucking blades, one of which is shown marked 9. In accordance with the invention, means are provided for holding the product firmly against the cylinder after it has been released by the pins so that the folding blade will effect the fold of the product in the proper position, and these holding means are adjustable while the machine is running circumferentially of the cylinder, so that the position at which the product is folded off may be accurately determined. While the particular form of holding devices may be somewhat varied, in the particular construction illustrated these holding devices are in the form of a plurality of rolls, three such rolls 10, 11 and 12 being shown, these rolls being secured to a shaft 13 driven in any suitable manner.

These rolls are, as illustrated, fast on the shaft and are provided with a cut away portion 14, leaving high portions 15 between which and the cylinder the products are nipped and prevented from slipping. As the rolls rotate, the high points 15 move away and permit the product to be freely withdrawn by the folding off rolls. It will be understood that while the cut away areas are shown on the rolls the cylinder may also be cut away at points opposite the rolls to provide means for permitting the disengagement of the sheets when the tucking blade comes into operation.

In accordance with the present invention, means are provided for adjusting the rolls circumferentially of the cylinder, these means being preferably such that they may operate while the machine is running. Furthermore, in the best constructions, these rolls, where rolls are employed, will be mounted rigidly so that a firm pinch or nip of the product against the cylinder will be effected, and no slip of the product will occur.

While the specific construction for effecting these functions may be somewhat varied, as illustrated, there are provided a pair of arms 16, 17, which are mounted in hubs 18, 19, rotatably or pivotally supported on the cylinder shaft 3, before referred to. These arms support the rolls 10, 11, 12 through connections hereinafter referred to, and at their other ends are provided with means whereby they may be rotated circumferentially of the cylinder, while the machine is running. As shown, there is provided a shaft 20 suitably supported in the framing 4, 5, before referred to, and this shaft at one side of the machine is provided with a hand-wheel 21 (Figure 2) by which the shaft 20 may be rotated. This shaft is provided at each end with gears 22, 23, which mesh with gears 24, 25 on screw rods 26, 27 engaging with the arms 16, 17 through threaded blocks 28. By turning the hand-wheel 21, it will be seen that the arms are rocked or rotated about their pivots and vary the position of the holding rolls 10, 11, 12 relatively to the circumference of the folding cylinder, and that this adjustment may be made while the press is running.

The holding rolls may be supported in various ways, but as before stated this is preferably effected so that the rolls have a rigid mounting, and the rolls and their supporting means are therefore rigidly mounted in the machine. As shown, the shaft 13, which carries the rolls 10, 11, 12, is supported in end bearings 29, 42. The bearing 29, adjacent the roll 10, has a stem or neck portion 30 which is adjustable in a sleeve or block 31 formed integrally with a supporting member 32 on a cross-shaft 33 rigidly mounted between the arms 16, 17 by means of set screws 60, 61.

Intermediate the bearings 29, 42 is a bearing 35 on the shaft 13. This bearing has a neck or stem 36, adjustable in a sleeve or block 37, having an integral part 38 secured to the shaft 33, an integral web 39 connecting with a block 40 on a cross-shaft 41 mounted in the arms 16, 17, and held in position by set screws 41', this serving to provide a rigid structure.

The bearing 42, adjacent the roll 12, has a neck or stem 43 adjustable in a block or sleeve 44 which is secured to the side arm 17, before referred to. The pressure of the holding rolls may be adjusted, if desired, by the adjusting nuts 70 provided for each of the stems 30, 36, 43, so as to accommodate products of different thicknesses, or for other reasons. With this construction it will be seen that the holding rolls are so mounted as to rigidly hold the product against the cylinder so that there is no danger of a slip of the product after it is released by the sheet taking devices.

In the best constructions, guides are provided for guiding or supporting the product as it is taken by the sheet taking devices around the cylinder, and such guides or supports are indicated in dotted lines in Figure 1 by the numerals 45, 46, these guides being curved, as shown, supported by arms 46', 47 suitably supported in the machine.

The tucking blades tuck or fold off the product into the bite of folding rolls. While the particular arrangement of folding rolls may be varied, as shown, there is an upper pair of nipping or folding-off rolls directly cooperating with the folding-off blade 9, these rolls being marked 48, 49, and a lower pair of nipping or folding-off rolls 50, 51, these rolls being separated from the first pair of nipping rolls. Intermediate the two pairs of nipping rolls are gears 52, 53, these gears being driven by a driving gear 54 and in turn driving the nipping rolls.

Where this construction is employed, guides are provided for guiding the product from the first pair of nipping rolls to the second pair. These guides may, of course, vary in construction, but, as shown, comprise strips of any suitable material, marked 55, 56, which are supported at one end to shafts or rods 57, 58 and at the other ends are extended downwardly through grooves cut in the nipping rolls and are thus adapted to guide the products therebetween.

With the construction described, it will be seen that the roll supports are held rigidly with respect to the cylinder. In the best constructions, the rolls are allowed a slight play in their sup-

ports to accommodate products of different thicknesses, and this is conveniently effected by spring mounting the rolls. One such mechanism is shown in which the sleeve or block 37 is provided with a spring 36' for the neck or stem 36. While this has only been shown at the center bearing, it will be understood that the sleeves 31, 44 may be similarly equipped if desired.

The shaft 13 is driven in any suitable manner, as by a gear 59 keyed thereto, which meshes with a gear 60 keyed to the shaft of the cylinder 1, as shown in Figure 2.

It will be seen that with the construction shown and described a very simple and efficient mechanism has been provided for insuring the fold of a product to take place at the right point irrespective of the speed at which the machine may be operating. While the construction shown is a preferred one, it will be understood that changes and variations may be made in the arrangement and construction of the invention, and the invention is therefore not to be restricted to the mechanism or arrangement shown.

What is claimed is:

1. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, means for holding a sheet on the cylinder after it has been released by the sheet taking devices, and means for adjusting the holding means circumferentially of the cylinder.

2. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, means for holding a sheet on the cylinder after it has been released by the sheet taking devices, and means operable while the machine is running for adjusting the holding means circumferentially of the cylinder.

3. In a folding mechanism, the combination of a folding cylinder, a folding blade, sheet taking devices carried by the cylinder, means for holding a sheet on the cylinder after it has been released by the sheet taking devices, and means operable while the machine is running for adjusting the holding means relatively to the folding blade.

4. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, means for rigidly holding a sheet on the cylinder after it has been released by the sheet taking devices, and means for adjusting the holding means circumferentially of the cylinder.

5. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, means for rigidly holding a sheet on the cylinder after it has been released by the sheet taking devices, and means operable while the machine is running for adjusting the holding means circumferentially of the cylinder.

6. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, means for holding a sheet on the cylinder after it has been released by the sheet taking devices, means for adjusting the holding means to and from the cylinder, and means for adjusting the holding means circumferentially of the cylinder.

7. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, means for holding a sheet on the cylinder after it has been released by the sheet taking devices, means for adjusting the holding means to and from the cylinder, and means operable while the machine is running for adjusting the holding means circumferentially of the cylinder.

8. In a folding mechanism, the combination of a folding cylinder, sheet taking pins carried thereby, a plurality of holding members for holding a sheet on the cylinder after it has been released by the pins, a shaft on which the holding devices are mounted, supports for the shaft, and means operable while the machine is running for moving the supports circumferentially of the cylinder.

9. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, a plurality of holding rolls acting to hold a sheet on the cylinder, a shaft on which the rolls are mounted, a pair of arms supporting the shaft, and means operable while the machine is running for swinging the arms circumferentially of the cylinder.

10. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, a plurality of holding rolls acting to hold a sheet on the cylinder, a shaft on which the rolls are mounted, means for adjusting the shaft to and from the cylinder, and means for moving the shaft circumferentially of the cylinder.

11. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, a plurality of holding rolls acting to hold a sheet on the cylinder, a shaft on which the rolls are mounted, bearings for the shaft, a second shaft, connections from one of the bearings to the second shaft to effect a rigid support for the first shaft, and means for adjusting the shaft circumferentially of the cylinder.

12. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, a plurality of holding rolls acting to hold a sheet on the cylinder, a shaft on which the rolls are mounted, a pair of arms supporting the shaft, bearings for the shaft, a second shaft supported in the arms, connections from one of the bearings to the second shaft, and means for swinging the arms circumferentially of the cylinder while the machine is running.

13. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, holding devices acting to hold a sheet on the cylinder, means for permitting the holding devices to release a sheet, and means for adjusting the holding devices circumferentially of the cylinder.

14. In a folding mechanism, the combination of a folding cylinder, sheet taking devices carried thereby, holding devices acting to hold a sheet on the cylinder, means for permitting the holding devices to release a sheet, and means operable while the machine is running for adjusting the holding devices circumferentially of the cylinder.

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