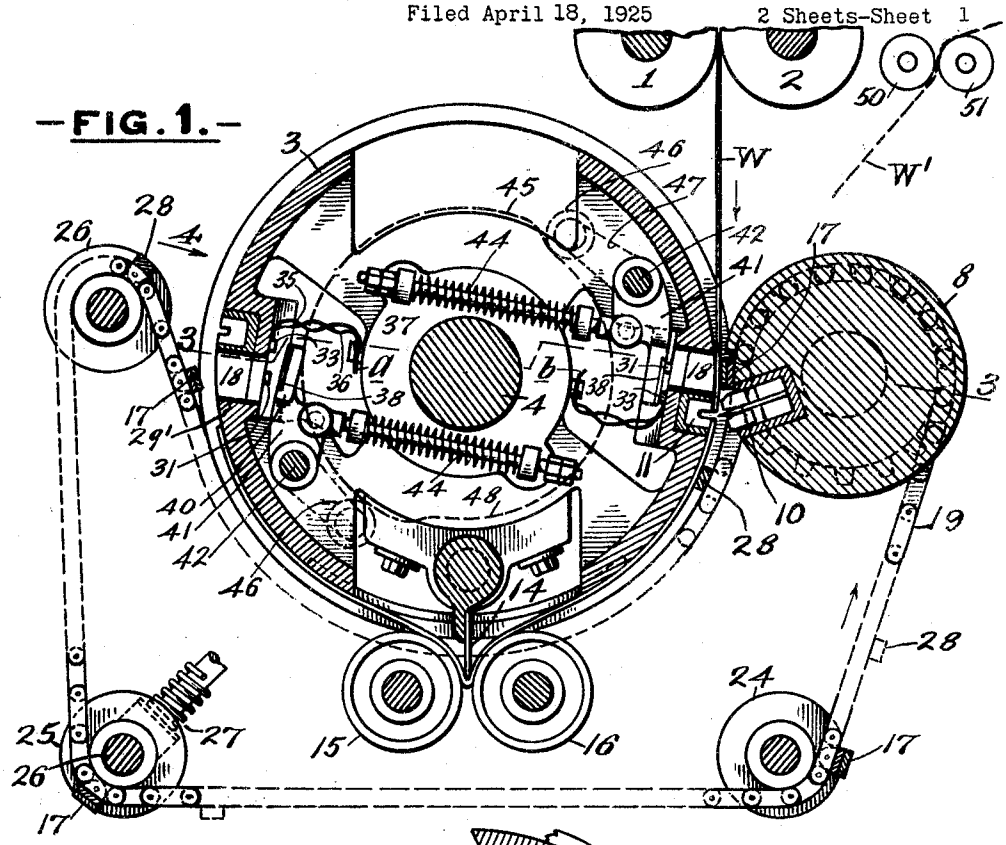
Feb. 5, 1929. 1,701,055

E. P. SHELDON

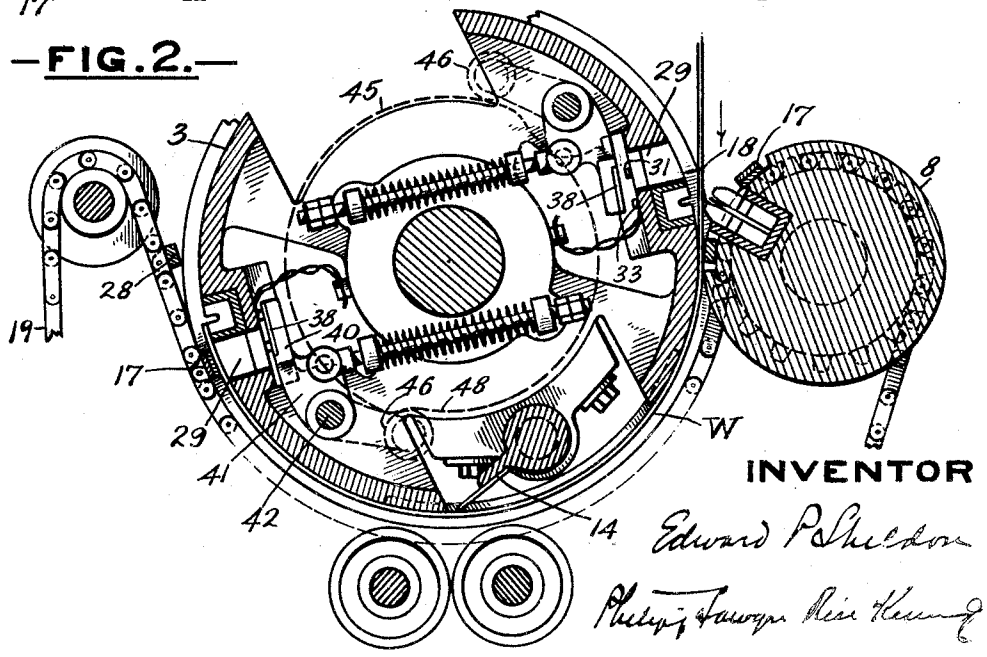
FOLDING MECHANISM

Filed April 18, 1925 2 Sheets-Sheet 1

—FIG. 1.—



—FIG. 2.—



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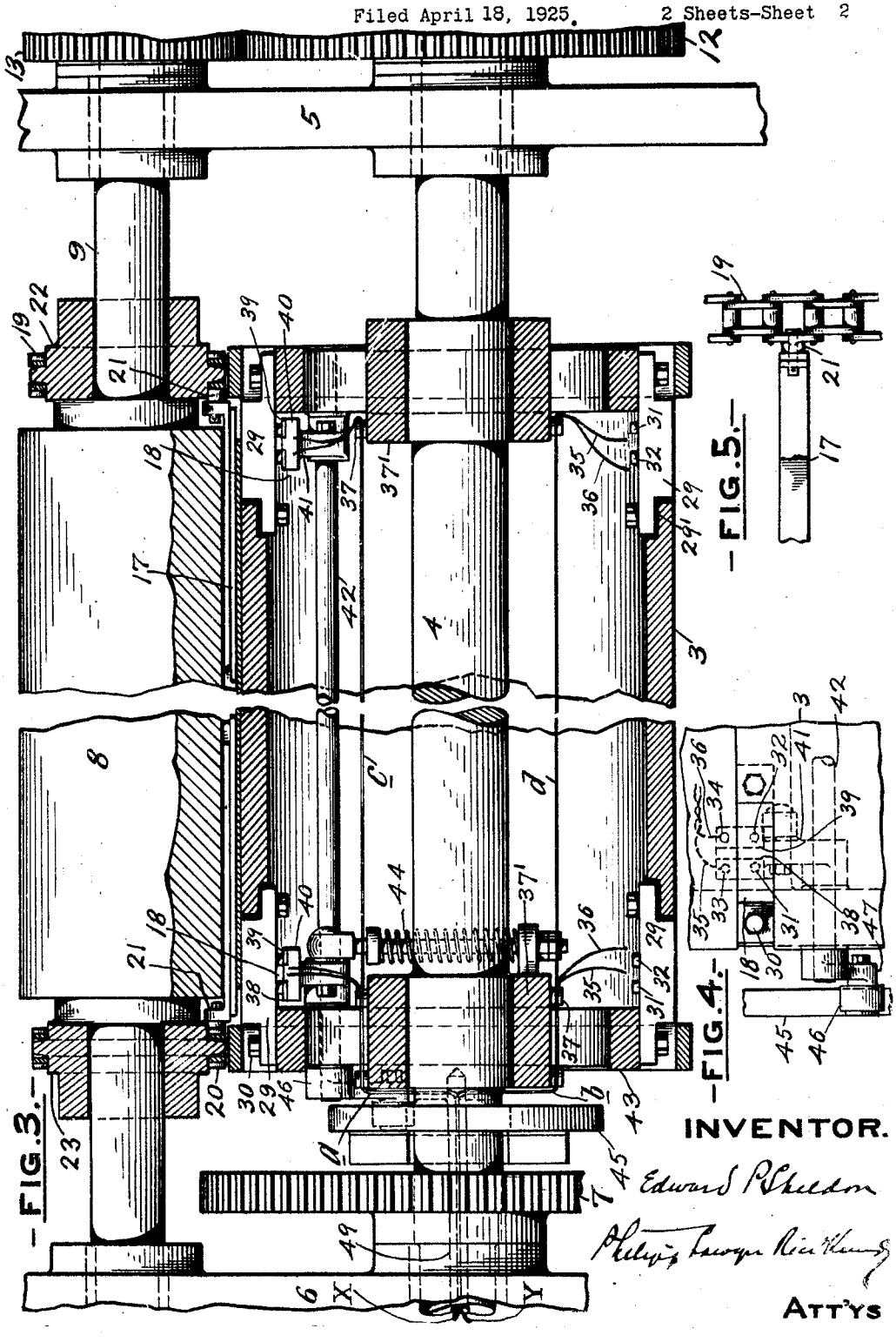


FIG. 3.

FIG. 5.

FIG. 4.

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Patented Feb. 5, 1929. 1,701,055

UNITED STATES PATENT OFFICE.

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FOLDING MECHANISM.

Application filed April 18, 1925. Serial No. 24,018.

This invention relates to certain improvements in folding mechanism.

In certain types of folding mechanisms, particularly the high speed folding mechanisms employed with rotary printing machines, the products to be folded are forwarded to the folding mechanism which is usually a cylinder. This product is folded off the cylinder by a folding blade which tucks the product into the bite of a pair of folding off rolls or like mechanism. Where the product to be folded is a web, or where the cut sheets are forwarded and associated, the product is carried around the cylinder to the folding off point, and in the case of a web, a sheet length is cut from the web. To carry products around the cylinder, various sheet-taking devices have been employed, the most usual one being pins, though grippers have been used under some circumstances. Where pins are employed for taking the products, the pins penetrate the product and thus injure it. This is a disadvantage in many classes of products, the pinholes injuring the margins. Furthermore, where pins have been employed, injury to the product frequently results when the pins are withdrawn to free the product so that it can be tucked off. Grippers are unsatisfactory because it is difficult to time the mechanism for opening and closing the gripper whereby they take and release the product, particularly at the high speeds at which these rotary folders are run.

It is the especial object of the present invention to produce a folding mechanism in which sheet-taking devices are employed for taking the sheet around the cylinder or other folding mechanism, these sheet-taking devices being of such character that they act to clamp the sheet firmly in position without penetrating the sheet, and a mechanism being provided for operating these sheet-taking devices of such character that they can be accurately timed at the high speeds at which these folding mechanisms operate.

A further object of the invention is to produce a simple construction for effecting this, the parts of which are so arranged as not to interfere with the cutting mechanism when this is used.

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

In these drawings,—

Figure 1 is a central sectional view through the improved mechanism, the parts being shown in the position occupied when the product is being folded off;

Figure 2 is a similar view, partly broken away, showing the parts in the position they occupy just before the folding operation;

Figure 3 is a longitudinal sectional view, partly broken away, the section being taken on the irregular line 3—3 of Figure 1;

Figure 4 is a detail plan view, partly broken away, of one of the clamp bar operating mechanisms, the view being taken in the direction of the arrow 4 of Figure 1; and

Figure 5 is a detail plan view of a portion of a clamp bar and its supporting devices.

Referring now to these drawings, the invention has been illustrated in connection with a rotary folding mechanism in which sheets are cut from a web, or associated webs, and folded. It will be understood, however, that the invention is applicable for folding cut sheets supplied from any suitable source.

Broadly speaking, in carrying out the invention there are provided clamping devices which are electrically operated to clamp the paper in forwarding position, these clamping devices being preferably of magnetic material which are operated at the proper time to clamp down on the surface of the product and clamp the product on the forwarding carrier by which it is forwarded to folding off position. Cooperating with these clamping devices are electrically operated mechanisms, as magnets, which are operated to attract the clamping devices to clamp the product and release the product when it is to be folded off the carrier.

In the particular construction illustrated, a web W is forwarded by a pair of forwarding rolls 1, 2 from any suitable source of supply, as a printing machine, not shown, and this web is forwarded to the folding mechanism. This folding mechanism, in the construction shown, includes a rotary carrier in the form of a cylinder 3 supported on a shaft 4 suitably journaled in side

frames 5, 6 of the machine by which the parts are supported. This cylinder has at one end a gear 7 by which it is driven from any suitable source of power.

In the particular machine illustrated, sheets are cut from this web and folded. There is, accordingly, provided a cutting mechanism in the form of a cylinder 8 mounted on a shaft 9 suitably supported in the side frames 5, 6 before referred to, this cylinder being provided with the usual cutting knife 10 which cuts against the usual cutting woods 11 provided on the folding cylinder, the cutting cylinder in the particular construction shown being half of the diameter of the folding cylinder so as to effect a cutting action for each half revolution of the folding cylinder. This cutting cylinder may be driven in any suitable manner.

In the particular construction illustrated, the shaft 4 of the folding cylinder, at the end opposite the gear 7, is provided with a gear 12 which is in mesh with and drives a gear 13 at the end of the shaft 9 of the cutting cylinder. The folding cylinder is, as usual, provided with a pivoted folding blade 14 which is operated through any suitable mechanism, not shown, to tuck the product off into the bite of a folding off mechanism, shown as a pair of rolls 15, 16.

In accordance with the invention, electrically operated clamps are provided which will act to clamp the product onto the surface of the carrier whereby the product is not damaged and the clamp may be operated to clamp and release the product at speeds which will permit of its employment with high speed rotary folding mechanisms.

In the best construction, the clamp is magnetically operated as with this form of clamp the operating mechanism can be very simple.

In the specific construction shown, there are provided a series of clamping bars 17 with which cooperates the required number of magnetic clutch devices, indicated generally by the numeral 18, (see Fig. 4).

In the best construction the magnetic clamp bars 17 are supported outside the cylinder, being carried on a suitable carrier, and the magnetic clutches are carried by the folding cylinder and these parts are arranged and timed so that the head end of the web is clamped against the surface of the cylinder just as a preceding web length has been cut from the web, the web being carried around the cylinder to the folding off point by the clamps which are then released to permit the tucking off of the product, the magnetic clutches acting through such portion of a revolution of a cylinder as may be necessary to effect the forwarding of the sheets to the proper point.

Where the clamps are supported outside the cylinder they will be carried on a clamp carrier which may assume various forms. As the clamps are drawn toward the surface of the cylinder by the magnetic action, this carrier will be preferably a flexible carrier to permit of a movement of the clamps to and away from the surface of the cylinder so that a good clamping action and release of the sheet is effected. In the particular construction illustrated, the clamp carrier is in the form of a pair of endless chains 19, 20 (see Fig. 3). The clamp bars extend, as shown, substantially across the cylinder and are provided with hubs 21 by which they are secured to the chains so as to travel therewith. These clamp bars are provided in required numbers depending on the products to be folded off, four such bars being shown in the drawings.

The bar carrier is a driven carrier and where the carrier is in the form of chains, these chains are conveniently driven from the cutting cylinder 8, before referred to. As shown, this cutting cylinder has fastened thereon a pair of driving sprockets 22, 23 over which the chains pass. In the best constructions, means are provided for adjusting and guiding the chains. As shown, there are provided three guide rolls 24, 25 and 26, these rolls and the cutting cylinder being so arranged that the chains will have a fairly close hug around the required portion of the periphery of the cylinder. One of these guiding and supporting rolls is, or may be, adjustable as, for instance, the roll 25, the shaft 26 of which is shown as being supported in bearings which are spring seated, a conventional spring bearing 27 being indicated for effecting this.

These chains, it will be understood, are of sufficient length to carry the required number of clamps so that a clamp will always be in position to take the product, depending on the speed at which the folding cylinder is operated, and it is understood, of course, that the clamps are arranged, and the clamp carrier is timed, so that the bar is never in the way of the folding blade when this blade is functioning to fold off the product.

In the operation of the device, the clamps take the leading end of the web just after the cutters have severed a preceding web length, this position of the parts being shown in Figure 1. After the cut is made the tail of the preceding sheet is loose, the head end of the cut sheet being held by another of the clamping bars. In the best constructions, means are provided for holding the tail of the cut sheet against the cylinder so as to prevent the sheet from falling away. While these means may be of various characters, where the clamp bars are carried on chains or like traveling carrier, these tail-holding means may likewise be carried on

chains. In the particular construction shown, there are provided holding bars 28, these bars being mounted on the chains slightly in advance of the clamping bars so that, when the parts are in the position shown in Figure 1, and the sheet has been cut, the holding bars are in position to hold the tail end of the sheet against the cylinder.

As before stated, in the preferred form of the invention, the bars are magnetically operated, such operation of the bars permitting the very quick taking and release movements necessary in these high speed folders, and to effect this the clutches 18, before referred to, are employed. The specific construction of these clutches and the means of supplying the necessary current thereto may be somewhat varied. In the particular construction shown, there are four such clutches, two clutches operating on the opposite ends of one of the clamp bars. The construction of these clutches is identical and the description of one will suffice for all. The clutch includes a stationary magnet block 29 set into a recess in the cylinder wall and being secured in place by suitable bolts 30, these blocks being insulated from the cylinder walls, as indicated at 29'. The outer surfaces of these magnets are curved to correspond with the periphery of the cylinder and are flush therewith. Each of these blocks (see Fig. 4) is provided with two contact points 31, 32. Two contacts 33, 34, carried on the cylinder 3 and insulated from the same, are connected to circuit wires 35, 36, the other ends of these wires being connected to the wires *a*, *b*, as by junction blocks 37, the blocks 37 being supported on, and insulated from, a collar 37' mounted on the cylinder shaft 4.

These circuits are completed for energizing these magnets at the proper time by means of contact plates 38, 39 carried on, and insulated from, a block 40 formed on a rock arm 41 mounted on a rock shaft 42 suitably supported in the heads 43 of the cylinder. The rock shaft is rocked to bring the plates into contact position by means of a spring rod construction 44, the spring acting to press the contact plates firmly against the contacts. The contact plates are, however, normally held out of contact by means of a cam 45 mounted on the cylinder shaft 4 through a cam roll 46 on an arm 47 mounted on the outer end of the rock shaft 42, before referred to. This cam 45 has a low part 48. When the roll 46 is on the high part of the cam, as shown in Fig. 2, the parts are out of contact. When, however, the roll rolls down on the low part of the cam, the springs rock the shaft and contact is made, this latter position of the parts being shown in Figure 1.

Current is supplied to the various magnets from a pair of leading-in wires X and Y which extend through a bore 49 in the cylinder shaft. The contacts by which current is supplied to these wires so that they may rotate with the cylinder is not shown, as this is a well known construction and is not necessary for an understanding of the invention. The leading-in wires are branched to form the circuit wires *a*, *b*, each of these latter being also branched as indicated at *c*, *d*, to supply the four magnets.

If desired, a second web or sheet may be associated with the web W, such web or sheet being indicated at W' and being led in from suitable forwarding devices, as rolls 50, 51, for association with the web W.

The specific construction for carrying out the invention is a convenient one. It is to be understood, however, that various changes may be made in such construction by which the invention can be carried into effect without departing therefrom and the invention consequently is not restricted to the specific form shown.

What is claimed is:

1. The combination with means for forwarding a product, of a folding mechanism, a magnet, and a cooperating armature therefor which engages the product and holds it in proper position to be acted on by the folding mechanism.

2. The combination with means for forwarding a product, of a rotary folding mechanism, a magnet, and a cooperating armature therefor which engages the product and holds it in proper position to be acted on by the folding mechanism.

3. The combination with means for forwarding a product, of a rotary folding cylinder, a magnet, and a cooperating armature for the magnet which engages the product and holds it in proper position on the folding cylinder to be acted on by the folding mechanism.

4. The combination with means for forwarding a product, of a rotary folding cylinder, magnets carried by the cylinder, cooperating armatures therefor acting to clamp a product on the cylinder.

5. The combination with means for forwarding a product, of a rotary folding cylinder, magnets carried by the cylinder, a carrier, and clamping devices on the carrier and actuated by the magnets to clamp a sheet on the cylinder.

6. The combination with means for forwarding a product, of a rotary folding cylinder, magnets carried by the cylinder, sheet holding devices actuated by the magnets for clamping a sheet on the cylinder, a circuit for the magnets, and means for intermittingly making and breaking the circuit to cause the sheet holding devices to take and release a sheet.

7. The combination with means for forwarding a product, of a rotary folding cyl-

inder, magnets carried by the cylinder, cooperating armatures independent of the cylinder actuated by the magnets for clamping a sheet on the cylinder, a circuit for the magnets, means normally tending to complete the circuit, and means for preventing the acting of the latter means.

8. The combination with means for forwarding a product, of a rotary folding cylinder, magnets carried by the cylinder, cooperating armatures independent of the cylinder actuated by the magnets for clamping a sheet on the cylinder, a circuit for the magnets, and a spring operated contact maker.

9. The combination with means for forwarding a product, of a rotary folding cylinder, magnets carried by the cylinder, cooperating armatures independent of the cylinder actuated by the magnets for clamping a sheet on the cylinder, a circuit for the magnets, a spring seated contact maker, and a cam acting to intermittently actuate the contact maker.

10. The combination with means for forwarding a product, of a rotary folding cylinder, a travelling carrier cooperating therewith, sheet holding devices on the carrier, and means for actuating the sheet holding devices to hold a sheet on the surface of the cylinder.

11. The combination with means for forwarding a product, of a rotary folding mechanism, a travelling carrier cooperating therewith, sheet holding devices on the carrier, and means acting to move the sheet holding devices toward the folding mechanism for holding a sheet thereon.

12. The combination with means for forwarding a web, of means for cutting a sheet therefrom, a rotary folding cylinder, a travelling carrier cooperating therewith, sheet holding devices on the carrier, and means for actuating the sheet holding devices to hold the head of a sheet against the surface of the cylinder.

13. The combination with means for forwarding a web, of means for cutting a sheet therefrom, a rotary folding mechanism, a travelling carrier cooperating therewith, sheet holding devices on the carrier, and means acting to move the sheet holding devices towards the folding mechanism for holding a sheet thereon.

14. The combination with means for forwarding a web, of means for cutting a sheet therefrom, means for associating a second sheet with the web, a rotary folding cylinder, a travelling carrier cooperating therewith, sheet holding devices on the carrier, and means for actuating the sheet holding devices to hold the sheets against the surface of the cylinder.

15. The combination with means for forwarding a product, of a rotary folding cylinder, a travelling carrier cooperating therewith, sheet holding devices on the carrier, and means on one of the members for actuating the sheet holding devices to hold a sheet on the surface of the cylinder.

16. The combination with means for forwarding a product, of a rotary folding cylinder, a travelling carrier cooperating therewith, sheet holding devices on the carrier, and means carried by the cylinder for actuating the sheet holding devices to hold a sheet on the surface of the cylinder.

17. The combination with means for forwarding a product, of a rotary folding cylinder, a carrier cooperating therewith, sheet holding devices on the carrier acting to hold the head and tail of a sheet on the surface of the cylinder.

18. The combination with means for forwarding a product, of a rotary folding cylinder, a carrier cooperating therewith, sheet holding devices on the carrier, electrically operated means for actuating the sheet holding devices to take and release the head of a sheet, and means for holding the tail of a sheet against the cylinder.

19. The combination with means for forwarding a product, of a rotary folding cylinder, a carrier cooperating therewith, sheet holding devices on the carrier, electrically operated means on the cylinder for actuating the sheet holding devices to take and release the head of a sheet, and means for holding the tail of a sheet against the cylinder.

20. The combination with means for forwarding a web, of means for cutting a sheet from the web, a folding mechanism, magnets, and armatures independent of the folding mechanism cooperating with the magnets and acting to clamp a sheet in proper position to be acted on by the folding mechanism.

21. The combination with means for forwarding a web, of means for cutting a sheet from the web, a rotary folding cylinder, and electrically operated means in part independent of the cylinder and engaging the sheet for holding it in proper position to be acted on by the folding mechanism.

22. The combination with means for forwarding a product, of a rotary folding cylinder, a flexible carrier cooperating therewith, sheet holding devices on the carrier, and means for actuating the sheet holding devices to hold a sheet on the cylinder.

23. The combination with means for forwarding a product, of a rotary folding cylinder, a flexible carrier cooperating therewith, sheet holding devices on the carrier, means carried by the cylinder for actuating the sheet holding devices to hold the head of a sheet on the cylinder, and means for holding the tail of a sheet against the cylinder.

24. The combination with means for forwarding a product, of a rotary folding cylinder, a cutting cylinder, a travelling carrier, sheet holding devices on the carrier, and means for actuating the sheet holding devices to hold a sheet on the cylinder just after the cutting mechanism has operated.

25. The combination with means for forwarding a product, of a rotary folding cylinder, a cutting cylinder, a carrier, sheet holding devices on the carrier, means for actuating the sheet holding devices to hold the head of a sheet on the cylinder just after the cutting mechanism has operated, and means operating to hold the tail of a preceding sheet on the cylinder.

26. The combination with means for forwarding a product, of a rotary folding cylinder, a cutting cylinder, a flexible carrier, sheet holding bars on the carrier acting to hold the head of a sheet on the carrier after the cutting mechanism has operated, and bars on the carrier acting before the cutting mechanism operates to hold the tail of a preceding sheet on the cylinder.

27. In a folder, the combination of a folding cylinder, a cooperating travelling carrier, sheet holding devices on the carrier, and means carried by the cylinder for actuating the sheet holding devices to press a sheet on the cylinder.

28. In a folder, the combination of a folding cylinder, a cooperating flexible carrier, clamps of magnetic material on the carrier, magnets on the cylinder, and means for intermittently energizing the magnets.

29. In a folder, the combination of a folding cylinder, endless chains, clamps of magnetic material on the chains, magnets on the cylinder, and means for intermittently energizing the magnets.

30. In a folder, the combination of a folding cylinder, endless chains, clamps of magnetic material on the chains for holding the head of a sheet, magnets on the cylinder, means for intermittently energizing the magnets to attract the clamps, and a second set of clamps on the carrier for holding the tail of a sheet.

31. In a folder, the combination of a folding cylinder, endless carriers, clamp bars of magnetic material on the carriers, magnets carried by the cylinder, means for intermittently energizing the magnets to attract the clamp bars, and means for adjusting the carriers.

32. In a folder, the combination of a folding cylinder, endless chains, guides for guiding the chains about the periphery of the cylinder, clamp bars of magnetic material on the chains, magnets carried by the cylinder, means for energizing the magnets intermittently to attract and release the clamp bars, and holding bars on the carrier not affected by the magnets.

33. In a folder, the combination of a folding cylinder, a cooperating cutting cylinder, flexible carriers driven from the cutting cylinder, clamps on the carriers, and means for moving the clamps to press a sheet on the cylinder.

34. In a folder, the combination of a rotary folding cylinder, a travelling carrier independent of but moving with the cylinder, armatures on the carrier, and magnets for operating the armatures to take a sheet at one position of the cylinder and release the sheet at another position of the cylinder.

35. In a folder, the combination of a rotary folding cylinder, a carrier independent of but moving with the cylinder, sheet taking clamps on the carrier, means for operating the clamps to take a sheet at one position of the cylinder and release the sheet at another position of the cylinder, and means for holding the tail of a sheet against the cylinder.

36. The combination with means for forwarding a product, of a rotary folding cylinder, a travelling carrier cooperating therewith, and sheet holding devices on the carrier acting to hold the head and tail of a sheet on the surface of the cylinder.

37. In a folder, the combination with means for forwarding a product, of a rotary folding cylinder to which the product is forwarded, a carrier cooperating therewith, armatures on the carrier, magnets on the folding cylinder, folding rolls for folding off products from the cylinder, and means whereby the magnets cause the armatures to clamp a product on the cylinder in proper relation with the folding rolls.

In testimony whereof, I have hereunto set my hand.

EDWARD P. SHELDON.