

[54] **ROTARY FOLDING APPARATUS**
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 [58] **Field of Search**..... 270/63-65, 71

[57] **ABSTRACT**

A rotary folding apparatus, having cam-controlled puncturing needles on one swing shaft associated with cam-controlled strippers, on another swing shaft.

First roller levers are supported rotatably and connected each via a compression spring to each of the swing shafts, and rigid levers are secured to each of the swing shafts, and bolts connect corresponding of the first roller levers to corresponding of the rigid levers. Second roller levers are firmly connected to the swing shafts and a radially swingable cam segment is disposed operatively in cooperation with the second roller levers.

[56] **References Cited**
UNITED STATES PATENTS
 1,419,188 6/1922 Wood et al. 270/65
 1,691,890 11/1928 Meisel..... 270/71
 1,784,757 12/1930 Scott..... 270/65
 1,561,908 11/1925 Cannard et al. 270/71
FOREIGN PATENTS OR APPLICATIONS
 1,204,689 11/1965 Germany 270/63

4 Claims, 4 Drawing Figures

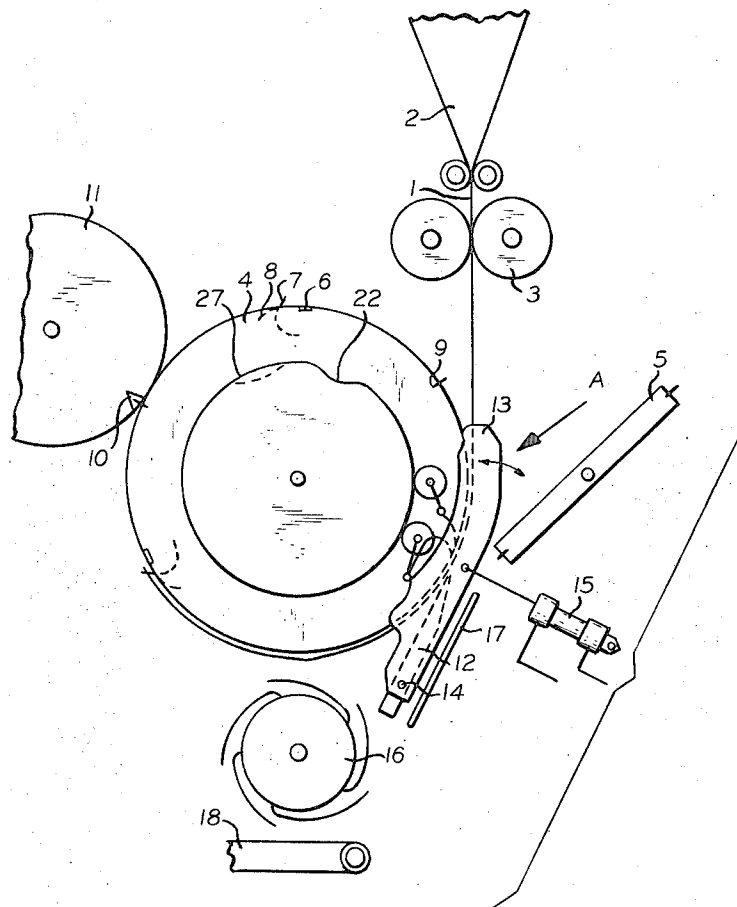


FIG. 1.

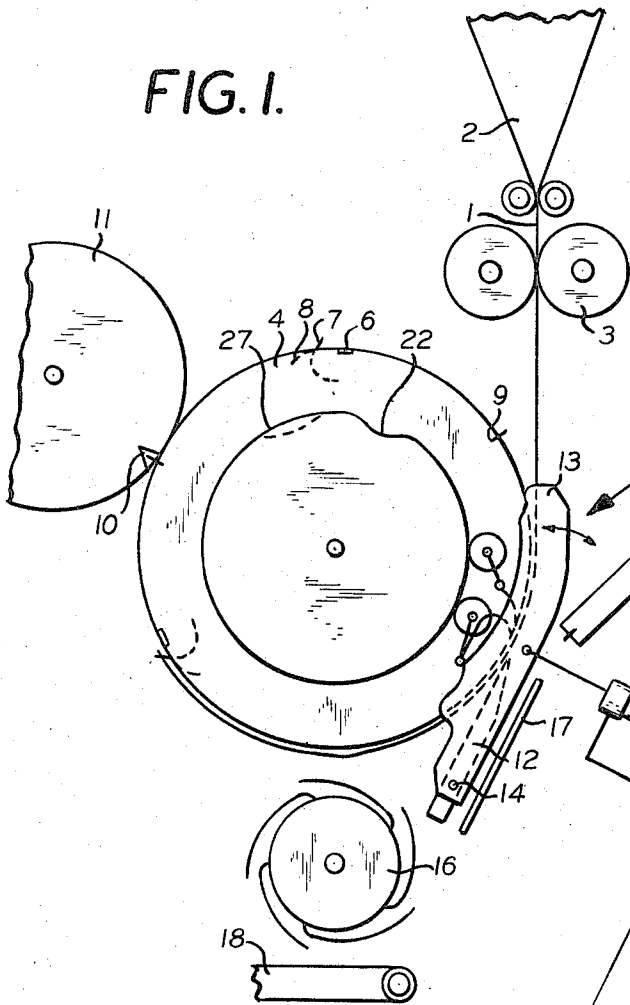


FIG. 4.

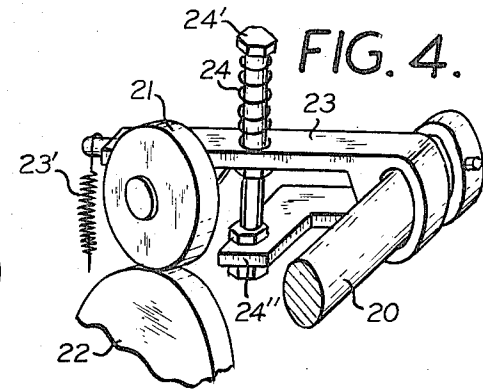


FIG. 3.

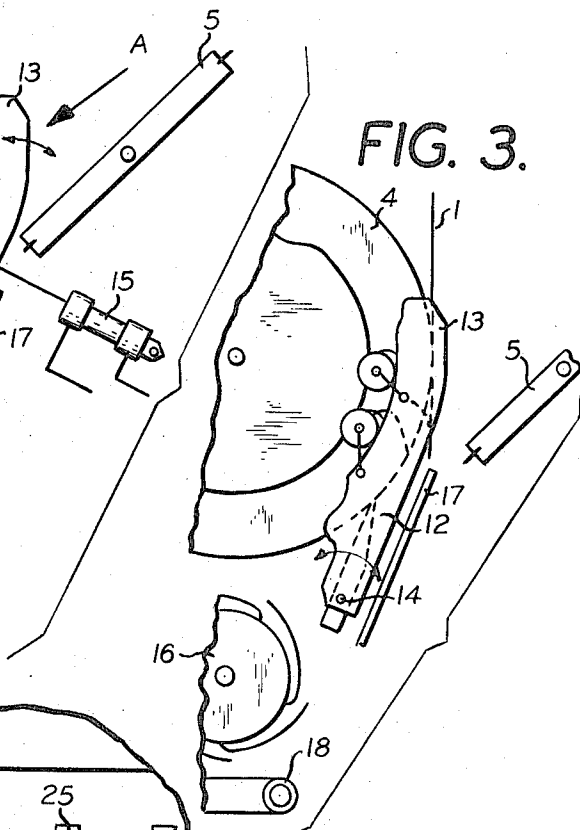
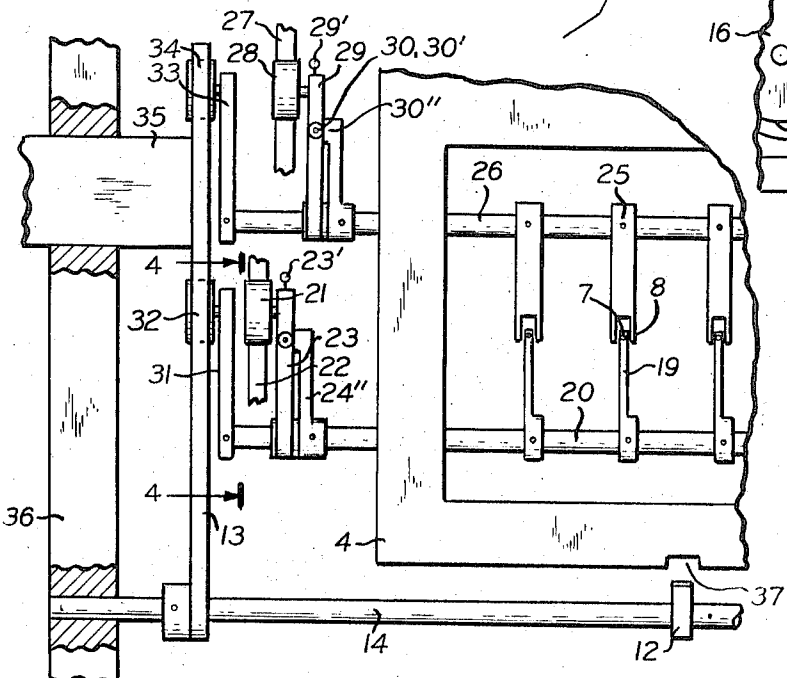


FIG. 2.



ROTARY FOLDING APPARATUS

The present invention relates to a rotary folding machine for web-fed presses. In these machines the webs printed on one or both sides are fed via a funnel folder which folds the web longitudinally to the cross folding unit which is frequently provided with a collecting cylinder in order to collect a plurality of longitudinally folded web sections, so-called products, and fold them jointly transversely to their direction of travel so as to form a newspaper, magazine, prospectus or the like.

In this connection the collecting cylinder is preferably at the same time developed in such a manner, that it bears the counterknives of a cross-cutter, which cuts the longitudinally folded web or webs, said cross-cutter bearing the means for the collecting and at the same time also the folding knives for the first transverse fold.

In order, inter alia, to reduce the amounts of movement of the collecting tools, it has been proposed to associate with the cam-controlled puncture needles of the collecting cylinder oppositely moving cam-controlled strippers. In this way the result is obtained, that at the time of release by puncturing needles the products are lifted by a slight amount from the collecting cylinder. This advantage is utilized by the present invention, in order definitely to avoid the further feeding of products in the case of stoppers in the cross folding unit and thereby exclude possible damage by breakage or other deformation.

In the known devices for protecting the folding apparatus from the danger of stoppers, a different path has been taken heretofore. Thus it is known, for instance, from British Pat. No. 482,578 to conduct stopper signals to a capping device. As soon as a stopper occurs, the press is stopped. Since in this case the rotatably moved masses cannot be braked suddenly, the web is still continued to be introduced for a certain period of time into the folder. The accumulation of product would, however, lead to damage and therefore by means of the capping device the web is cut by a cutting knife at the same moment, that the machine starts to be braked and is fed via a guide plate to the outside of the folder. The capping device is in this connection arranged behind the funnel or longitudinal folding device and in front of the cross-cutting device; in other words, nevertheless the piece of web or webs which are at the time between the capping device and the cross-cutting device is still fed to the cross folding unit. This can have a very unfavorable effect, particularly in the case of multi-web operation.

Thus, West German Pat. No. 1,125,949 also discloses means which, placed into action by stopper signals, hold the web fast and prevent it from being fed to the cross folding unit. The web which is still fed during the time of braking is guided, forming a loop, to outside the folder. With this device also there is the disadvantage, that the portion of the web which is between the cutting cylinders present here and the first guide cylinder which is relatively far away due to a system of belts and a transfer cylinder, is still fed. In the known apparatus there are concerned in this connection, for instance, with six longitudinally folded double webs, and therefore with a 12-times combined web. With such accumulations of material in the folding apparatus, the aforementioned damages — which are specifically to be avoided, however — occur, particularly in the case of multi-web operation.

It has become known in another connection to change the direction of travel of sheets or products by guide bars which can be swung into their path. Thus, for example, it is known from Swiss Pat. No. 472,329, to arrange a tongue swingable about an axle in such a manner, that in order to separate the products emerging from a folder, the products can be diverted into two different directions.

For the sampling of printing sheets it is also known, to swing guide bars in the path of travel of the sheets in order thereby to impart a different direction of travel to one or more sheets.

It is one object of the present invention, to provide a rotary folding apparatus which avoids the disadvantages of the prior art. Damage upon the occurrence of stoppers is to be substantially prevented and at the same time the useful value of the rotary folder is to be increased.

It is another object of the present invention, to provide a rotary folding apparatus, wherein at the moment of the occurrence of a stopper signal, the longitudinally folded products, which are still running out, including those present on the collecting cylinder, are moved away from the cross folding elements and with which, on the other hand, a single-fold delivery for normal operation is at the same time possible.

It is yet another object of the present invention to provide a rotary folding apparatus wherein, on the one hand, known guide bars arranged on a swivel shaft are arranged directly behind the cutting- and/or collecting-cylinder and, on the other hand, each of two roller levers is associated with the swivel shaft for the puncturing needles and the swivel shaft for the strippers. In this connection roller levers are rotatably supported and connected on the corresponding swivel shaft via, in each case one compression spring only, a bolt and a lever which is rigidly fastened to the swivel shaft, while second roller lever, into the sphere of action of which a cam segment can be radially swung, are arranged fixed on the swivel shafts.

In accordance with another feature of the present invention, the guide bars and the cam segment can be controlled by hand selectively as a function of stopper signals and/or as a single-fold delivery.

By the proposed invention the advantage in particular is obtained, that upon the occurrence of stoppers the further delivery of products to the folding cylinders is avoided without delay. At the same time, however, the result is also obtained, that it is possible to use the same device as used in the case of danger of stoppers, also for the normal delivery of only longitudinally folded products, as is frequently necessary.

With these and other objects in view, which will become apparent in the following detailed description, the present invention, which is shown by example only, will be clearly understood in connection with the accompanying drawings, in which:

FIG. 1 is a side elevation of the apparatus designed in accordance with the present invention;

FIG. 2 is an enlarged fragmentary elevation of the collecting cylinder, seen in the direction of the arrow A in FIG. 1;

FIG. 3 is a fragmentary view of the device of the present invention in a side view, with the machine elements brought into stopper position; and

FIG. 4 is a perspective section along the lines 4 — 4 of FIG. 2.

Referring now to the drawings, a web of paper 1 is fed from a printing press via a funnel folding device 2 and feed rollers 2 to a collecting cylinder 4 which cooperates with a knife cylinder or beam 5. On the periphery of the collecting cylinder 4 there are arranged counterknives 6, puncture needles 7 with deflectors 8 and the folder knives 9 cooperating with folding flaps 10 of a first folding-flap cylinder 11. Below the place where the paper web 1 is cut transversely to the direction of conveyance, there are located known guide bars 12 which, together with a cam segment 13, are swingable around or with a shaft 14. For this purpose a hydraulic working cylinder 15 controlled by stopper or other signals can be connected with the cam segment 13. The signal-dependent movement can, however, also be fed directly via the shaft 14. Known guide rails 17 furthermore extend in the direction towards a delivery vane wheel 16 which cooperates delivery belts 18.

In FIG. 2 the shape of the collecting cylinder 4 is shown in greater detail. The puncturing needles 7 are connected via levers 19 with a swing shaft 20, which receives its swinging movements via a cam roller 21 from a cam 22. In this connection the roller lever 23 bearing the cam roller 21 is fastened in loosely turnable manner on the swing shaft 20, but is connected via a correspondingly dimensioned compression spring 24, a bolt 24' and a lever 24'' with the swing shaft 20. In the same manner, the deflectors 8 are borne by levers 25, which are arranged fast on the swing shaft 26. They in turn receive their swinging movement from a cam 27 via a cam roller 28 and a roller lever 29, which is also only secured against lateral displacement and is connected by a second compression spring 30, a bolt 30' and a lever 30'' with the swing shaft 26.

Fixed on the swing shaft 20 is another roller lever 31 which bears a cam roller 32, which can cooperate with the cam segment 13. There is also fastened to the swing shaft 26 a roller lever 33 having a cam roller 34, which latter in its turn can cooperate with the cam segment 13.

A shaft 35 of the collecting cylinder 4 and the shaft 14 are supported in customary manner in a machine frame 36.

FIG. 4 shows how the loose roller levers 23 and 29 are connected with the corresponding swing shaft. The roller lever 23 is in this connection loosely rotatable on the swing shaft 20 and the cam roller 21 is held on the cam 22 merely by means of a tension spring 23'. The roller lever 23 is connected with a lever 24'' fastened rigidly on the swing shaft 20 by means of a bolt 24' and a compression spring 24. As soon as the swing shaft 20 is turned by the roller lever 31 or the cam segment 13 is turned further than provided by the roller lever 23, the compression spring 24 is compressed but readily permits the swinging movement of the swing shaft 20 provided for the event of stoppers.

In order that the guide bars 12 lift the products properly off from the collecting cylinder 4, annular grooves 37 can also in addition be provided on the circumference of said cylinder.

Upon the occurrence of a stopper signal the guide bars 12 and jointly with same the cam segment 13 are suddenly swung into the path of the products and of the cam rollers, respectively. In this way the cam rollers 32 and 34, as soon as they come into the region of action of the cam segments 13 by the further movement of the collecting cylinder 4, are imparted contact with the

cams of the cam segment 13. In this way the puncturing needles 7 of the collecting cylinder 4 are swung extensively back and the deflectors 8 are simultaneously swung out in known manner. The products which have already been collected and the newly arriving products leave, via the guide bars 12 and between them and the guide rails 17, the previous path of travel of the products and are fed to the delivery vane wheel 16 and thus to the delivery. A further advance of products into the actual cross-folding device is accordingly completely excluded after the occurrence of a stopper signal.

As already indicated, it is also possible to deliver simple newspaper supplements or the like which must merely be longitudinally folded, without dismantling the unit, by simply having a signal identical to the stopper signal given in known manner by hand or the like.

While I have disclosed one embodiment of the present invention, it is to be understood that this embodiment is given by example only and not in a limiting sense.

I claim:

1. A rotary folding apparatus, particularly a sheet material collection or cutting cylinder, comprising cam-controlled deflectors moveably disposed at the periphery of said cylinder and adapted to facilitate removal of sheet material from the cylinder, cam-controlled puncturing needles, adapted to secure sheet material to the cylinder, said needles located adjacent said deflectors when in an operative position and adapted to coordinately move with said cam-controlled deflectors to release the sheet material from the cylinder, guide bar means arranged on a pivot shaft cooperating with the periphery of said cylinder as a stripping means for changing the direction of travel of the sheet material, a first pivoting shaft to which said puncturing needles are operatively mounted and a second pivoting shaft to which said deflectors are operatively mounted, first levers supported rotatably about each of said pivoting shafts, respectively, first cam follower means on said first levers, rigid levers secured to each of said pivoting shafts, respectively, means resiliently interconnecting said first levers with said rigid levers respectively for joint rotational movement in a first rotational sense and allowing said first levers to move independently of said rigid levers in a second rotational sense, second levers firmly connected to said pivoting shafts, respectively, second cam follower means on said second levers, a radially swingable cam segment means mounted for pivoting exterior to said cylinder, and adapted for operative engagement with said second cam follower means to pivot said pivoting shafts such that said puncturing needles are swung in and said deflectors are swung out relative to the periphery of said cylinder and adapted for facilitating the release of sheet material from the cylinder, and said guide bar means adapted to be synchronized with said deflectors and puncturing needles for changing the direction of travel of said sheet material.
2. The rotary folding apparatus, as set forth in claim 1, further comprising

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manual means for controlling said guide bar means and said cam segment means selectively as a function of one of stopper signals and of a single-fold delivery.

3. The rotary folding apparatus, as set forth in claim 1, wherein

said resilient interconnecting means comprises a compression spring disposed on a bolt against said first lever on a side thereof facing away from said rigid lever,

said bolt is connected between said first lever and

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said rigid lever to permit said first lever, in said second rotational direction, to move away from said rigid lever against the force of said compression spring, and to rigidly connect said first lever to said rigid lever for joint movement in said first rotational direction.

4. The rotary folding apparatus, as set forth in claim 3, further comprising

cam means for operating said first cam follower means.

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