Aug. 29, 1933. S. G. ROWLES 1,924,754

ROTARY FOLDER FOR PAPER BAG MAKING AND SIMILAR MACHINES

Filed Nov. 2, 1931 3 Sheets-Sheet 1

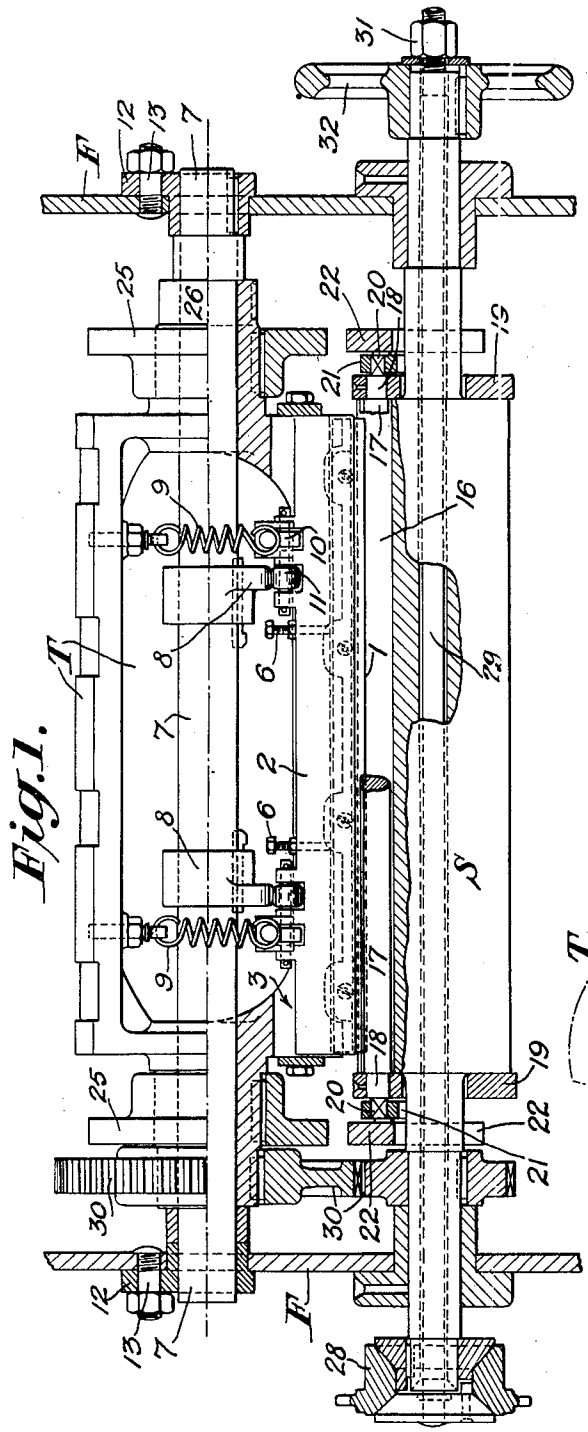


Fig. 1.

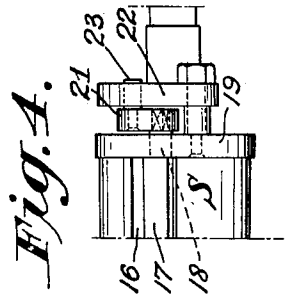


Fig. 4.

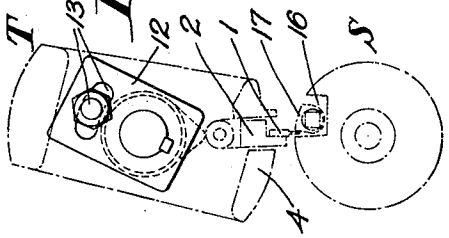


Fig. 3.

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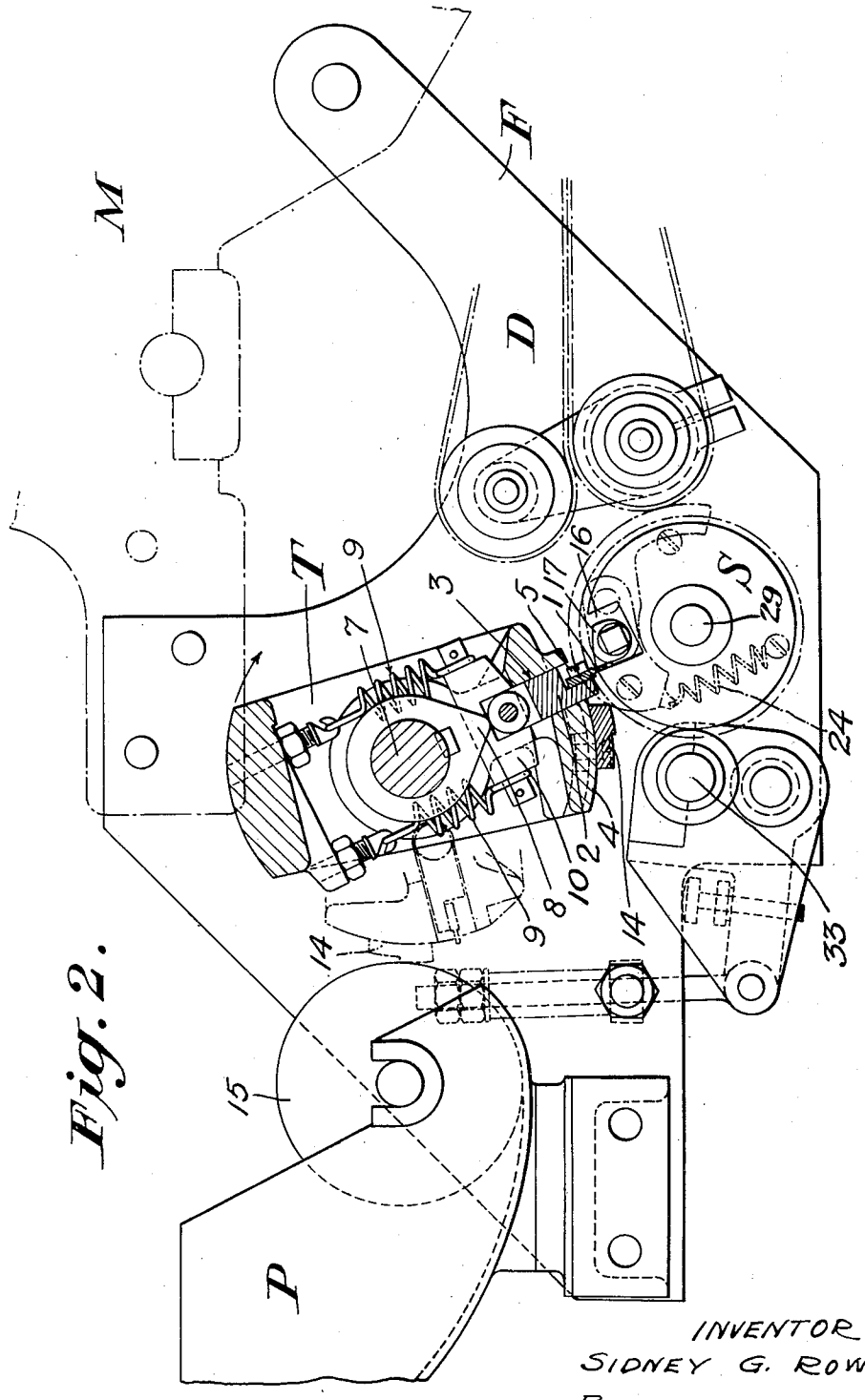


Fig. 2.

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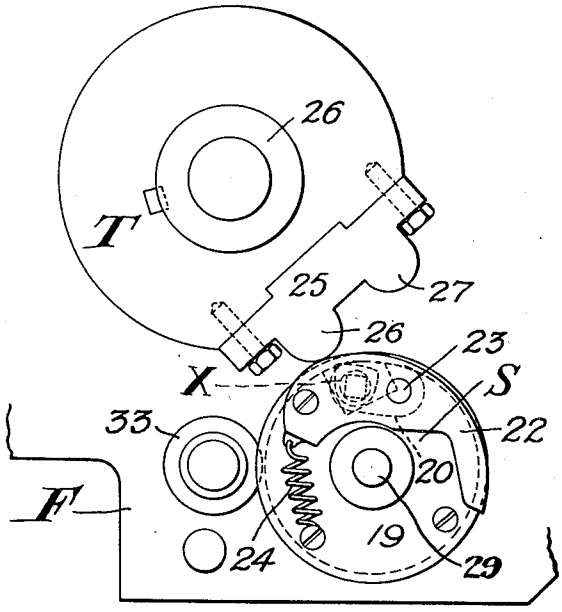


Fig. 5.

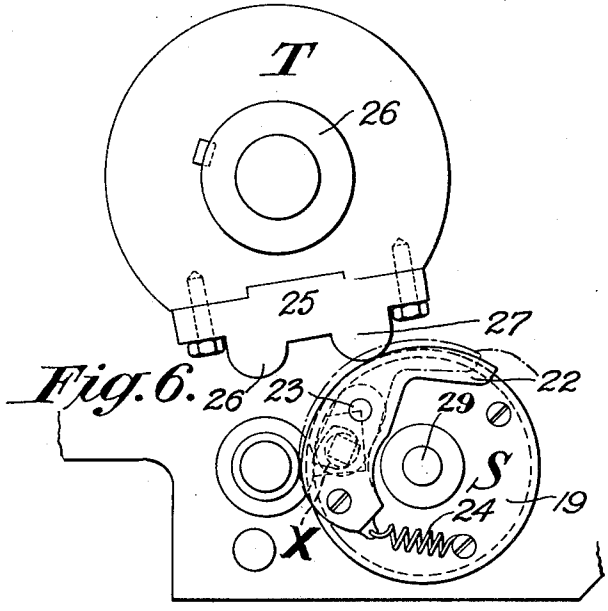


Fig. 6.

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Patented Aug. 29, 1933 1,924,754

UNITED STATES PATENT OFFICE

1,924,754

ROTARY FOLDER FOR PAPER-BAG MAKING AND SIMILAR MACHINES

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Application November 2, 1931, Serial No. 572,682, and in Great Britain January 24, 1931

5 Claims. (Cl. 93—27)

This invention relates to rotary folders for automatically applying a turned-over end or transverse fold to sections of a paper or like web or flat tube. The said invention is particularly designed for operating on sections of a flat paper tube which have been formed and cut in the process of making paper bags, and includes in this respect a pasting element whereby closed bag-ends are formed.

The invention relates more particularly to that type of rotary folder embodying a pair of co-acting cylinders, one of which (the slot cylinder) contains a folding slot which houses a movable nipping element, whilst the other (the tucking cylinder) carries a tucker blade which has a working arrangement synchronizing with the slot and nipping element of the slot cylinder. In this type the paper tube section arrives between the two cylinders and the tucker blade tucks the end in double-over formation, into the folding slot, whereupon the nipping device nips and presses the tucked-in double end; following this, as the cylinders rotate the tucking blade leaves the folding slot and later the nipping element opens to free the folded bag-end. In some constructions the tucker blade is arranged to reciprocate radially. If paste has been previously applied to the end of the tubular section, then a pasted and folded-over closed bag-end is formed.

The present invention has for its object certain improvements in this type of rotary folder, and, primarily, is concerned with a new method of operating the nipping element whereby the bag-end or equivalent is tucked into the folding slot, then tightly nipped, then retained in the nipped condition under pressure for an appreciable period of the cycle of operations, then finally released and discharged from the folder. A further object is to improve the construction of a radially reciprocating tucker blade which co-operates with such a nipping device. The invention has for another object to provide an adjustment for the tucker blade whereby it can be brought into an exact working relation with the folding slot and nipper device so that it can tuck at the precise moment desired and leave the folding slot without fouling or dragging out the tucked-in material; this is a great consideration because an optimum position for one class of paper may not suit another, and for example the tucker blade should not approach as near to the leading edge of the folding slot with thick paper as it does with a thinner grade. A further object is to provide a main adjustment whereby the folding action can be readily timed in relation to the other mechanisms of the bag-making machine, i. e. the section cutter and the printing device, so that the fold line can be placed any required distance from the cut-end of the paper tube.

According to the present invention, the nipping element (which is preferably a solid bar as distinct from an inherently springy blade) normally presses, such as by means of a suitable tension, spring, against the leading edge of the folding slot, and co-operates with means (e. g. a double cam on the tucking cylinder) causing it to open momentarily for the tucking operation, then to close for nipping whilst the slot cylinder makes a partial rotation, say, less than a quarter of a revolution, then to open momentarily for releasing the folded end. This gives two distinct openings during each cycle between which gripping or nipping pressure is being applied to the fold. A sharp fold line is thus formed, and there is an appreciable time whilst the fold is held, minimizing the chance of the paste not sticking the superimposed folds.

The solid nipping bar, in a preferable embodiment, has a flat or arcuate top area, which, in the closed position, substantially closes the folding slot as a continuation of the general periphery of the slot cylinder, and as the bar is always in the closed position, except for two short-period openings, the paper-bag sections do not have to bridge a wide slot gap. This leads to smooth-running work and a good fold.

In attaining the further objects already pointed out, the invention also consists of improvements in the tucking cylinder with its radially reciprocating blade, and its adjustments, and the other features outlined, all as more particularly described later and defined in the appended claims.

From the foregoing a general understanding of the invention will have been gained, and in order that the said invention may be clearly understood, reference is directed to the following description and accompanying drawings, wherein:—

Figure 1 is an elevation, partly in section, of a rotary folder according to the invention;

Figure 2 is a side elevation showing the tucking cylinder in transverse section, and the slot-cylinder with an end plate removed;

Figure 3 is a diagrammatic end view illustrating the cam adjustment for the tucking cylinder;

Figure 4 is a plan view of an end of the slot cylinder showing the device for working the nipping bar; and

Figures 5 and 6 are end views of both cylinders illustrating the double-cam action between the

cylinders for synchronously working the nipping bar movement.

Referring to the embodiment illustrated in the accompanying drawings, the tucking cylinder is designated as a whole by the reference letter T, and the slot cylinder by the letter S. Other broad or general structures are the paste box P and the main side frames F which support the rotary folder, as a whole, and which are bolted or otherwise secured to the framework M. The framework M can be a part of a printing unit or part of a bag-making machine. In the embodiment to be described, it will be assumed, for convenience, that partly manufactured bags are being delivered from a printer M, by the delivery device D, so as to be formed with closed ends by the present invention.

The tucking cylinder is provided with a tucker blade 1 adjustably attached to the tucking blade holder 2 which is slidably movable in a radial direction in the blade slot 3 formed in the peripheral wall 4 of the hollow cylinder T. The blade attachment is preferably by screws 5, and set-screws 6 (see Figure 1) provide means for adjusting the length of blade edge projecting from the holder 2.

The cylinder T and its blade 1 (and associated parts described in the preceding paragraph) revolve around the fixed cam-shaft 7 mounted between the side plates or frames F. One or more cams, preferably a pair 8, 8, are fixed to the shaft 7 inside the hollow cylinder T, and the blade holder 2 is kept firmly against the cams 8, 8 by two pairs of tension springs 9, 9 secured at one end to the yokes 10 of the holder 2, and at the other end to the opposite wall of the cylinder T. The holder is provided with cam-bearing rollers 11, 11. It will be apparent that as the cylinder T revolves around the fixed cams, the tucker blade 1 will be forced out at a point where the holder 2 (by its rollers 11) encounters the bumps of the cams I.

The position of the cams 8 in relation to the axis of the slot cylinder can be adjusted to vary the point where the blade 1 is fully extended. For this purpose (see Figures 1 and 3) the shaft 7 is capable of a small degree of adjustable movement in the side frames F by angularly moving the plates 12 which are keyed to the shaft 7. The bolt and slot 13 provide a locking device.

On the exterior of the wall 4 of cylinder T, in front of the blade 1, is a pasting blade 14, adapted to pick up a film of paste from the roller 15 of the past box P.

The slot cylinder S has a longitudinal folding slot 16, housing a rigid and solid nipping bar 17, formed with end trunnions or journals 18, by which it is pivoted between end-plates, 19 fixedly secured to the cylinder ends. The trunnions 18 have squared extensions 20 by means of which arms 21 respectively are attached. The arms are each pivotally attached to a curved lever 22, at points 23 respectively, and said lever is itself pivoted to the end plate 19 at x— see Figures 5 and 6. The levers 22 can thus swing in a plane at right-angles to the axis of the cylinder S. They are normally pulled in one direction by springs 24 (see particularly Figures 5 and 6) whereby through the aforesaid links 20, they normally hold the nipping bar 17 in a closed position, as in Figure 2.

This nipping bar 17 is arranged to move in synchronism with the rotation of the tucking cylinder T, and its movement is caused and controlled by the said cylinder T by means of a double cam 25 (Figures 5 and 6 particularly). This latter is mounted on a sleeve 26 forming part of the upper cylinder T, and thus rotates with said cylinder. The cam 25 has two bumps 26 and 27 circumferentially spaced apart, and just before the arrival of the tucker blade 1 to enter the folding slot 16, the bump 26 engages the lever 22, pressing it inwards momentarily to open the space between the nipping bar 17 and the leading edge of the slot 16 (cylinder S rotating anti-clockwise). The nipping bar immediately closes, and shortly afterwards the cam bump 27 again momentarily opens the bar opening, after the cylinder S has turned through an angle less than a quarter of a revolution.

The nipping bar 17 has a flat or arcuate top surface adapted to lie substantially flush with the periphery of the slot cylinder S, when in the closed position (e. g. Figure 2), and to close most of the superficial area of the mouth of the folding slot 16.

The drive is from the sprocket 28 (driven synchronously with the printing unit M) on to the shaft 29 of the cylinder S (see Figure 1), and by the pinions 30 on to the tucking cylinder T. The whole assembly (cylinders S and T with their operative elements, and gears 30) can be rotated for adjustment bodily, irrespective of the drive at 28, by slacking off the nut 31, and turning the handwheel 32, with the advantages hereinbefore indicated.

In operation the flat tube sections are delivered by the tapes D to the space between the cylinders T and S; the pasting blade 14 pastes a margin across the end of the section, and according to the adjustment already given by the hand wheel 32, the bag travels between the cylinders a certain distance before the tucker blade 1 and folding slot 16 come into register. Thereupon cam bump 26 opens the nipping bar 17, the tucker blade 1 is pushed out by its cam 8, and the bag is folded into the slot 16, the nipping bar 17 immediately closes to pinch or nip the fold whilst the blade 1 leaves the slot 16. The folded bag is carried around by the cylinder S to the dipper roll 33 just after which the cam bump 27 momentarily opens the nipping bar 17, and the folded and pasted bag-end springs and falls out of the slot, the bag being delivered on to a conveyor or equivalent underneath the dipping roller.

The phrase "flat tube" herein means a tube of any suitable cross-section (e. g. a plain longitudinal fold-over, or with pleated sides such as in satchel bags) folded flat.

I claim:—

1. In mechanism of the character described, a normally fixed shaft, a tucking cylinder rotatable on said shaft, a tucking blade mounted on said cylinder for inward and outward movement relative thereto, resilient means constantly urging the tucking blade inwardly, and cam means on said shaft for cooperation with said tucking blade to force the latter outwardly as the cylinder rotates on the shaft.

2. In mechanism of the character described, a normally fixed rotatably adjustable shaft, a tucking cylinder rotatable on said shaft, a tucking blade mounted on said cylinder for inward and outward movement relative thereto, resilient means constantly urging the tucking blade inwardly, and cam means on said shaft for cooperation with said tucking blade to force the latter outwardly as the cylinder rotates on the shaft.

3. In mechanism of the character described, a rotatable slot cylinder, a nipping bar rockable in the slot thereof, a rotatable tucking cylinder, a tucking blade carried by said tucking cylinder for cooperation with the nipping bar of the slot cylinder, a lever carried by the slot cylinder and connected to the nipping bar for rocking said bar, and cam means secured to the tucking cylinder and engageable with said lever to swing the same to rock the nipping bar.

4. In mechanism of the character described, a rotatable slot cylinder, a cooperating rotatable tucking cylinder, a permanent driving connection between said cylinders, means whereby the slot cylinder may be rotatably adjusted relative to the tucking cylinder without disturbing the driving connection between said cylinders, a normally fixed shaft on which the tucking cylinder is rotatable, a radially movable tucking blade carried by the tucking cylinder, cam means on said shaft for moving said blade outwardly as the tucking cylinder rotates relative to said shaft, said shaft being mounted for rotatable adjustment, and means for securing said shaft in different rotatably adjusted positions.

5. In mechanism of the character described, a rotatable slot cylinder, a nipping bar rockable in the slot thereof, a lever having a pivot fixed with respect to said cylinder, an arm fixed to said nipping bar and pivoted to said lever, a rotatable tucking cylinder, and a cam rotatable with said tucking cylinder, said lever having a portion disposed to be engaged and swung by said cam during relative rotation of the cylinders thus to rock the nipping bar.

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