United States Patent

Stemmler

[15] **3,668,982**

[45] **June 13, 1972**

[54] APPARATUS FOR FOLDING THE CLOSING FLAP OF ENVELOPES

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[22] Filed: **March 19, 1971**

[21] Appl. No.: **126,125**

[30] **Foreign Application Priority Data**

March 26, 1970 Germany ..... P 20 14 702.8

[52] **U.S. Cl.** **93/62**

[51] **Int. Cl.** **B31b 21/00**

[58] **Field of Search** 93/62, 61, 63

[56] **References Cited**

UNITED STATES PATENTS

3,116,668	1/1964	Novick	93/62
3,557,666	1/1971	Stemmler	93/62

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[57] **ABSTRACT**

A machine for making envelopes has an apparatus for folding the closing flap of envelopes which includes a rotary prefolding cylinder provided with fixed abutment edges and suction holes, a mating cylinder having a rotary folding strip, a stop abutment for the prefolded envelope, a finish folding cylinder having suction holes and moving in the opposite direction to the prefolding cylinder and a pressing segment cylinder associated with the finish folding cylinder.

3 Claims, 2 Drawing Figures

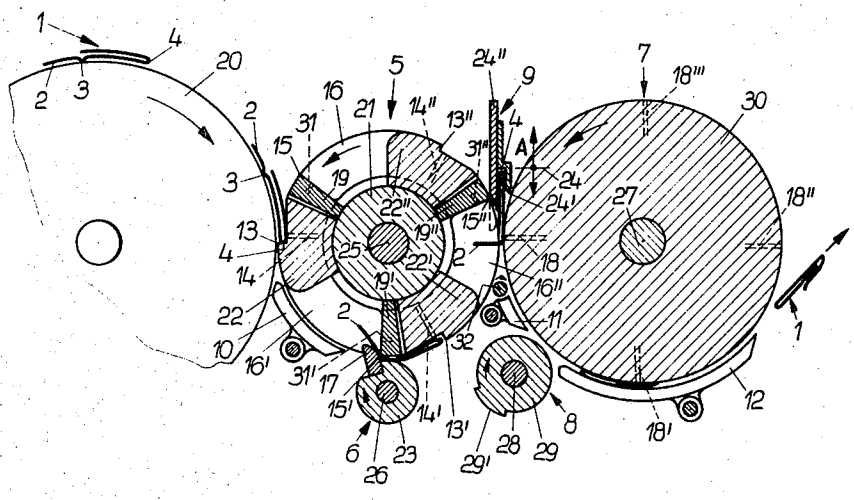
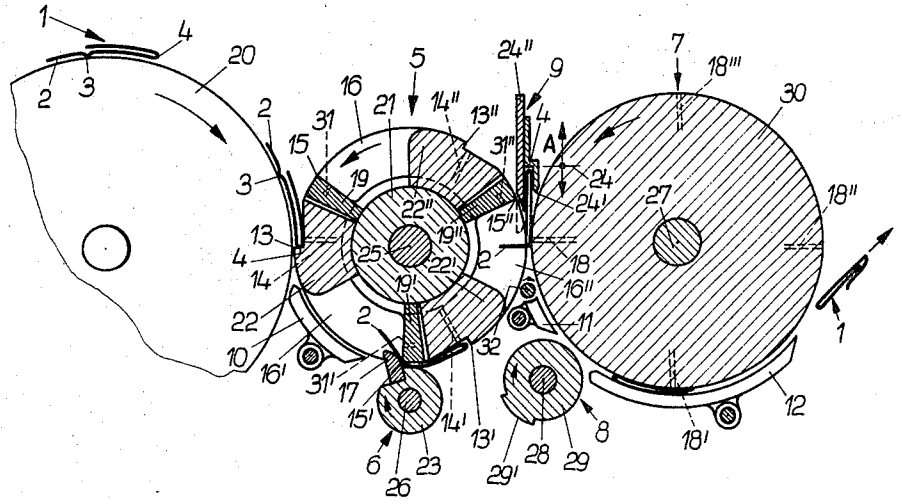


Fig. 1



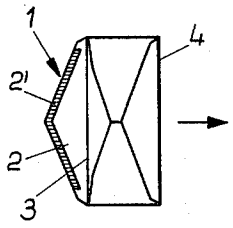


Fig. 2

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APPARATUS FOR FOLDING THE CLOSING FLAP OF ENVELOPES

This invention relates to apparatus for folding the closing flap of envelopes or the like of paper or the like in machines for the manufacture thereof in which the blanks, moving without interruption through the machine, are folded on the side flaps and the bottom flaps and are adhesively joined, generally after application and drying of the adhesive on the subsequent closing flap, the closing flap of each blank being subsequently folded over the other flaps along a creased folding line.

Known apparatus for folding the closing flap and which operates reliably at a low envelope output rate are unsuitable for the output rates required at the present time which exceed **1000** and more per minute. Difficulties occur even in existing high-speed apparatus. Since it is normally required for the closing flap to be sharply folded, it follows that the cylinders for folding such flaps must be positioned at a small distance from each other or must in fact thrust against each other with spring loading. However, a certain quantity of air is always present in the previously folded middle part of the envelope. During the rapid passage of the envelope, to be folded along its closing flap, this air has insufficient time to escape from between the very narrowly set folding cylinders and may thus cause destruction of the envelope. Alternately, it may be necessary to dispense with the desired sharp folding of the closing flap.

An object of the present invention is to eliminate the drawbacks of existing constructions and to provide an apparatus of a comparatively simple nature which is most efficient in operation and which permits a sharp folding of the closing flap at the output rate which is greatly in excess of 1,000 envelopes per minute.

Other objects of the present invention will become apparant in the course of the following specification.

In the accomplishment of the objectives of the present invention it was found desirable to provide an apparatus to which the envelopes are individually and successively supplied, said envelopes being completely folded with the exception of the closing flap and being creased along the subsequent folding line of the closing flap, a rotating pre-folding cylinder being provided having uniformly disposed on its circumference a plurality of fixed abutment edges for the alignment of the incoming envelopes, each of said edges being associated with at least one row of suction holes for the retention of the envelopes on the prefolding cylinder and being also associated with one prefolding edge having an adjoining recess into which engages a rotating folding strip of a mating cylinder, operating at the same circumferential speed as the prefolding cylinder, to bend the closing flap through approximately 90°, a stop abutment, disposed downstream of the prefolding cylinder being provided and against which the bottom edge of the prefolded envelope is guided, a finish folding cylinder, moving in the opposite direction to the prefolding cylinder and having uniformly distributed over its circumference a plurality of rows of suction holes being provided for taking over the envelopes and a pressing segment cylinder, rotating at the same circumferential speed being associated with the finish folding cylinder for producing a sharp fold on the closing flap.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawing showing by way of example only, a preferred embodiment of the inventive idea.

In the drawing:

FIG. **1** is a longitudinal section through the apparatus of the present invention.

FIG. **2** is a plan view of an envelope, supplied to the apparatus, and finish folded with the exception of the closing flap.

The apparatus according to the present invention comprises a prefolding cylinder **5**, a mating cylinder **6** co-operating therewith, a stop abutment **9**, a finish folding cylinder **7** and a pressing segment cylinder **8** co-operating therewith. The prefolding cylinder **5**, the mating cylinder **6**, the finish folding cylinder **7** and the pressing segment cylinder **8** are rotatably journalled in apparatus side walls not shown and are driven, in a manner not shown, at the identical circumferential speed and rotate in the sense of the directional arrows shown in the drawing.

The prefolding cylinder **5** comprises a shaft **25**, and a cylinder member **21**, fixedly joined thereto and having stop abutments **22**, **22'**, **22''** screw-mounted thereon. Each of the screw abutments is provided with one abutment edge **13**, **13'**, **13''** as well as with three rows of suction holes **14**, **14'**, **14''** being disposed closely behind these edges in the direction of rotation. The rows of suction holes are temporarily connected by control elements (not shown) to a suction air duct and serve to retain the envelopes **1** on the prefolding cylinder **5**. Prefolding segments **19**, **19'**, **19''**, disposed behind the stop abutment segments in the direction of rotation, having prefolding edges **15**, **15'**, **15''** and three rows of suction holes **21**, **31'**, **31''**, each of which is temporarily connected through control elements, not shown, to a suction air duct, are all coupled to each other to permit simultaneous and co-directional adjustment on the cylinder member **21** in the manner described hereinbelow. For setting up, the angular dimensions between the stop abutment edges **13**, **13'**, **13''** and the corresponding prefolding edges **15**, **15'**, **15''** are transferred to the height of the envelope size to be processed. Recesses, designated with the numerals **16**, **16'**, **16''** are disposed between the fronts of the stop abutment segments **22**, **22'**, **22''** and the prefolding edges **15**, **15'**, **15''** of the prefolding segments **19**, **19'**, **19''** which lead in the direction of rotation.

The mating cylinder **6** comprises a shaft **26**, a cylinder member **23**, fixedly connected thereto, and a folding strip **17**, screw mounted on the cylinder member. The cross-section of the folding strip is constructed so that the part which leads in the direction of rotation and projects from the surface of the cylinder member **23** takes the form of an involute curve. The cylinder member **23** of the mating cylinder **6** is disposed at a small radial distance from the surface of the prefolding cylinder **5**, said distance corresponding approximately to the thickness of a folded envelope. The prefolding cylinder **5** and the mating cylinder **6** roll against each other, each rotation causing the folding strip **17** to penetrate into one of the recesses **16**, **16'**, **16''** of the prefolding cylinder **5**.

A stop abutment **9** with a stop abutment surface **24** is disposed between the prefolding cylinder **5** and the finish folding cylinder **7**. Guide plates **24'** and **24''** are further parts of the stop abutment. The position of the stop abutment surface **24** can be adjusted, in a manner not shown in detail, along the direction of the double arrow A for the purpose of adaptation to the height of the envelope to be processed, and can be locked after the adjustment has been made.

The finish folding cylinder **7** comprises a shaft **27** and cylinder member **30**, fixedly joined thereto, the surface of which is positioned at a distance of approximately 1 mm relative to the prefolding cylinder **5**. The prefolding cylinder **5** and the finish folding cylinder **7** rotate in the same direction the oppositely disposed surfaces of said cylinders therefore move in opposite directions. The cylinder member **30** is provided with rows of suction holes **18**, **18'**, **18''**, **18'''**, uniformly distributed over its curcumference. These rows of suction holes are temporarily connected by control means not shown, to a suction duct and are provided to retain the envelopes **1** on the finish folding cylinder **7**.

The press segment cylinder **8** comprises the shaft **28**, the segment member, fixedly connected thereto, and having the extension **29'**, the surface of which forms part of a cylinder surface. During rotation the zone of the extension **29'** of the cylinder **8** presses with spring loading on to the finish folding cylinder **7** but there is no physical contact between the two cylinders outside the extension **29'**.

A guide **10** is associated with the prefolding cylinder **5**, guides **11** and **12** being associated with the finish folding cylinder **7**.

A small auxiliary cylinder **32**, rotating at the circumferential speed of the finish folding cylinder **7** but being positioned at a small radial distance therefrom, is disposed in front of the guide **11**.

The operation of the described apparatus is as follows: An envelope **1**, creased along the subsequent folding line **3** of the closing flap and finish folded with the exception of the closing flap **2** which trails in the conveying direction arrives on the feed cylinder **20** with the dried closing flap gumming **2'** uppermost and with the leading bottom edge **4** as shown in FIG. **2** to be taken over by the prefolding cylinder **5**. Since the feed cylinder **20** has a circumferential speed which is slightly higher than that of the prefolding cylinder **5**, the bottom edge **4** of the incoming envelope **1** is thrust against the stop abutment edge **13** or **13'** or **13''** and is thus aligned. Immediately behind the bottom edge **4** the envelope is taken up by the suction hole row **14** or **14'** or **14''**, said row of suction holes being connected to a suction duct at the moment of transfer so that the envelope is held on the abutment stop segment **22** or **22'** or **22''**. Rotation of the prefolding cylinder **5** causes the envelope to be passed along the guide **10** so that the creased folding line **3** of the flap **2** is disposed precisely above the prefolding edge **15** or **15'** or **15''**. After the prefolding edge has passed beyond the end of the guide **10** the closing flap **2** is bent from its extended position along the folding line **3** and through the prefolding edge **15** or **15'** or **15''** by the rotating folding strip **17** of the mating roller **6** with its involute shaped flank which ingresses into the recess **16** or **16'** or **16''**. At the same time, the closing flap **2** of the envelope is drain off and retained in this position by the suction hole row **31** or **31'** or **31''** which is connected at that moment of time to a suction duct. Further rotation causes the involute shaped flank of the folding strip **17** to roll on the closing flap **2** which is thrust against the external surface of the prefolding segment **19** or **19'** or **19''** to leave the recess **16** or **16'** or **16''**. After the row of suction holes **14** or **14'** or **14''**, and a little later the suction hole row **31**, **31'** or **31''** are disconnected from the suction duct and connected to ambient air, the envelope with the prefolded closing flap is released by the prefolding cylinder **5** and the bottom edge **4** of the said envelope is guided against the stop abutment surface **24** of the stop abutment **9**. In this position the envelope is drawn off by the suction hole row **18** or **18'**, **18''** or **18'''** of the finish folding cylinder **7**, is retained in this position and is supplied, with the prefolded closing flap leading, past the auxiliary cylinder **32** and the guide **11** to the pressing segment cylinder **8** in the direction opposite to the preceeding conveying direction. Prior to reaching the auxiliary cylinder **32** and the guide **11**, the opposite motion of the prefolding cylinder **5** causes the closing flap **2** of the envelope to be further folded by the rounded leading edge of the stop abutment segment **22** or **22'** or **22''** to facilitate guiding past the guide **11** by being assisted through the rotating auxiliary cylinder **32**. The pressing segment cylinder produces a sharp closing flap fold during rotation between the extension **29'** of the segment member **29** and the surface of the cylinder member **30** of the finish folding cylinder **7**. Since pressing takes place only in the zone of the extension **29**, any air which may be entrapped in the folded envelope will not interfere with the folding operation. The envelope, retained by the suction hole row **18** or **18'**, **18''** or **18'''** leaves the finish folding cylinder **7** after the suction hole row is disconnected from the suction duct and connected to the external air. Subsequent guide elements which are not shown then take over the finish folded envelope **1** and transfer it either for further processing such as printing, bundling, boxing or transfer it directly to a delivery apparatus.

I claim:

1. An apparatus for folding the closing flap of envelopes or the like, comprising a rotary prefolding cylinder having a plurality of abutment edges uniformly disposed on its circumference, suction holes associated with said abutment edges, prefolding edges and recesses adjoining said prefolding edges, a rotary mating cylinder having a folding strip adapted to engage any one of said recesses, said mating cylinder rotating at the same circumferential speed as said prefolding cylinder, a stop abutment located downstream of the prefolding cylinder and adapted to project into any one of said recesses, a finish folding cylinder located adjacent said prefolding cylinder and moving in an opposite direction thereto, said finish folding cylinder having a plurality of rows of suction holes, and a pressing segment cylinder located adjacent said finish folding cylinder and rotating at the same circumferential speed.

2. An apparatus in accordance with claim **1**, wherein said prefolding cylinder comprises prefolding segments adjacent said prefolding edges and stop abutment segments adjacent said abutment edges.

3. An apparatus in accordance with claim **2**, wherein said prefolding cylinder comprises spider arms supporting said prefolding segments.

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