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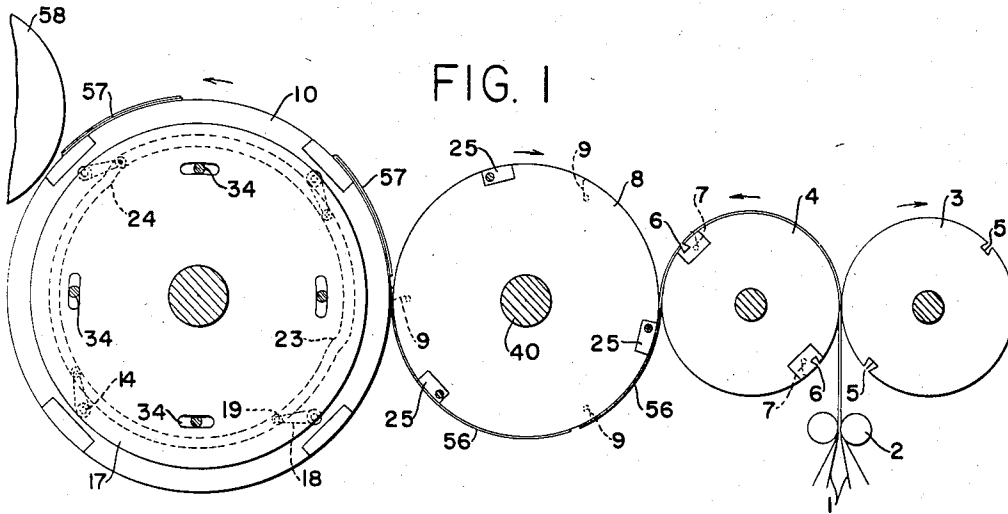
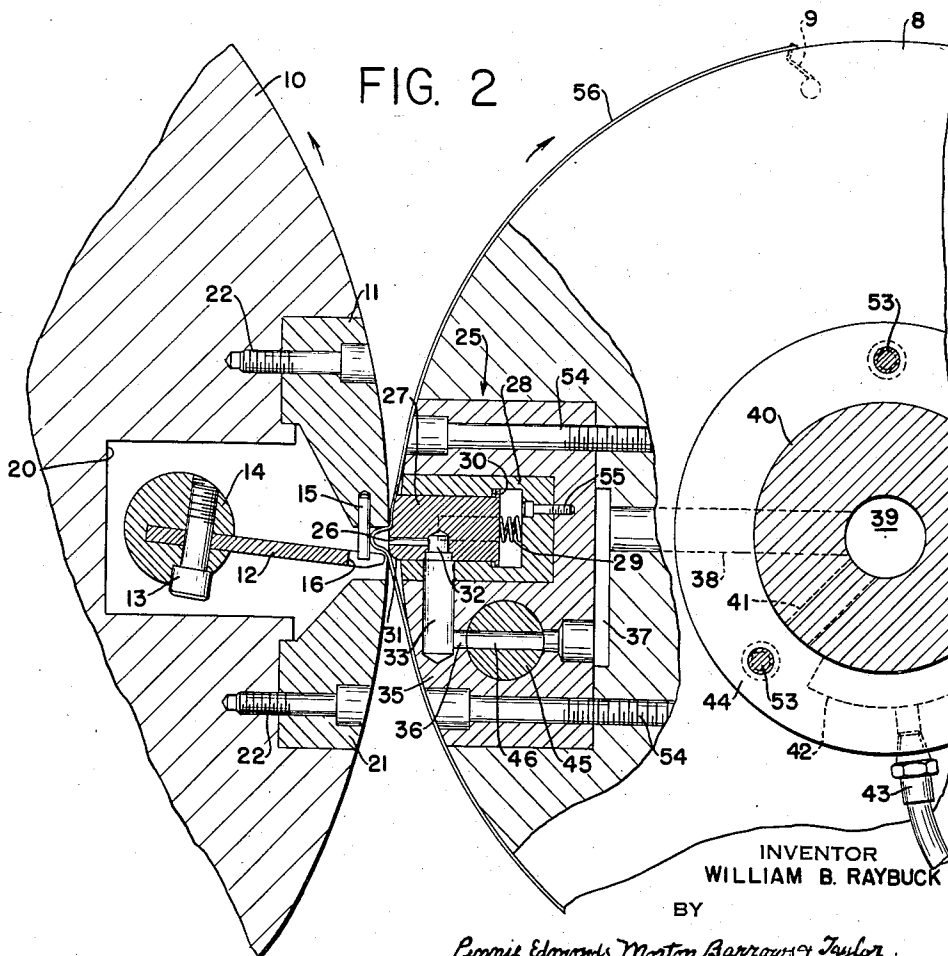
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FOLDER FOR PRINTING PRESSES

Filed July 10, 1956

2 Sheets-Sheet 1



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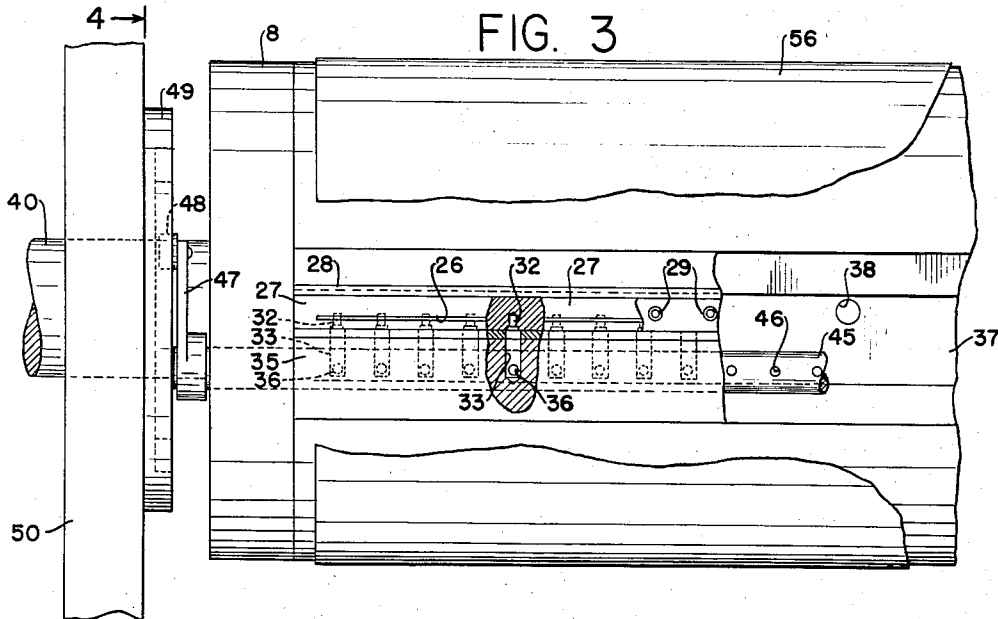
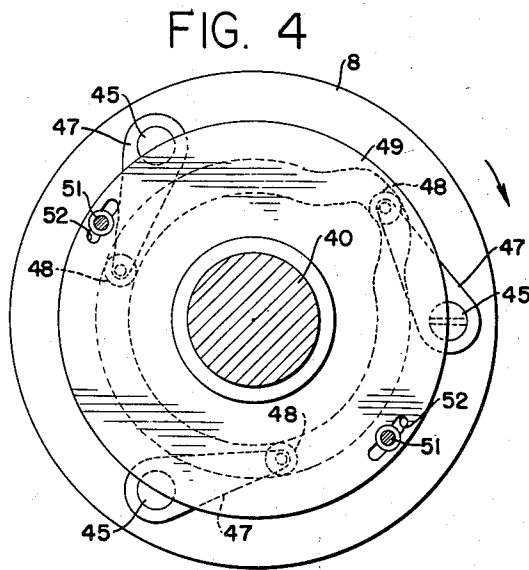
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FOLDER FOR PRINTING PRESSES

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Application July 10, 1956, Serial No. 596,991

9 Claims. (Cl. 270—69)

The present invention relates to improvements in method and apparatus for folding sheets of paper or the like, and is especially useful in folding printed sheets as they are delivered from a printing press.

It is conventional practice in the operation of web-fed printing presses, for instance, to slit the printed web as it passes from the press into ribbons of page widths running longitudinally of the web. These ribbons are then passed through a cutter adapted to cut the ribbons transversely into double-page lengths which are subsequently folded transversely of their length at a point intermediate their ends. The present invention particularly concerns a method and means for making this transverse folder.

It is customary to assembly and align a number of such ribbons and pass the aligned ribbons through the bite between two co-acting cutting rolls, one of which is equipped with one or more cutting blades running the length thereof and the other having cooperating slots. By this means, the assembled ribbons are cut into the double-page lengths.

These double-page lengths are then picked up from one of the cutting rolls by one of a pair of cooperating folding rolls, one of which has one or more longitudinal grooves in its periphery each equipped with automatically clamping jaws. The second of the folding rolls is usually equipped with one or more retractable blades, known as tucker blades, coinciding with the clamping jaws and adapted to force or tuck a midportion of the assembled double pages between the clamping jaws at the moment of coincidence. The jaws are then automatically closed on the inserted portion of the sheets, thus clamping the sheets, and the folded sheets are carried by the jaws to a delivery table where they are released by the automatic opening of the jaws.

In this operation, the tucker blade is automatically pushed outwardly, by synchronized operating means, at the instant the two points on the peripheries of the respective rollers come together. As the clamping jaws close, the tucker blade is automatically withdrawn into its recess in the periphery of the second roll.

A difficulty frequently experienced in the operation of such folders is that the tucker blade, as it is withdrawn from between the jaws, tends to pull the adjacent sheet of paper along with it from between the clamping jaws thus disarranging the folded sheets. This difficulty is more frequently experienced when a relatively large number of sheets are passed together to the folding rolls.

It is a primary object of the present invention to avoid the difficulties heretofore experienced with the operation of folders using tucker blades. This, and other advantages as will hereinafter appear, is accomplished in accordance with my present invention by avoiding the use of tucker blades and substituting therefor a longitudinally extending jet of gas under pressure, air for instance, for forcing the sheets into the opening between the clamping jaws.

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The invention will be more fully described and illustrated with reference to the accompanying drawings which represent conventionally and somewhat diagrammatically one embodiment of the invention, and of which

Fig. 1 is an end view of cooperating rolls, including a pair of cutting rolls and a pair of folding rolls, and showing the path of the paper through the machine,

Fig. 2 is a somewhat enlarged, fragmentary sectional view of the cooperating folding rolls at the bite between those rolls,

Fig. 3 is a fragmentary longitudinal view of one end of one of the folding rolls partly broken away to show interior conduits, for supplying the gas to the jet orifice and

Fig. 4 is a transverse view along line 4—4 of Fig. 3.

Referring more particularly to Fig. 1, a plurality of aligned ribbons 1 from a longitudinal cutter, not shown, are combined and passed between guide rolls 2 and from thence the assembled and aligned ribbons pass between the cooperating cutting rolls 3 and 4. The two cutting blades 5 extend longitudinally along the periphery of roll 3, and roll 4 is provided with cooperating cutting grooves 6. As the ribbons pass through the bite between rolls 3 and 4, they are cut transversely and their forward edges are impaled on the retractable pins 7 which are extended automatically all as well understood by the art.

These cut sheets are then carried by roll 4 into the bite between that roll and cooperating roll 3, at which point pins 7 are automatically retracted and pins 9 automatically extended to impale the forward edges of the sheets so as to carry the sheets into the bite between roll 3 and cooperating folding roll 10.

Roll 10 is provided with four pairs of longitudinally extending clamping jaws, as more clearly shown in Fig. 2, comprising a stationary jaw 11 and a cooperating moveable jaw 12. Jaw 12 is secured at its inner end by machine screws 13 to a rotatably mounted shaft 14. Guide pins 15, secured in stationary jaw 11 and extending through cooperating openings 16 near the outer end of jaw 12, are provided to act as stops for the paper being inserted between the jaws.

The respective rolls are rotatably mounted on parallel axes and are supported at each end by extending shafts which in turn are supported by the folder side-frames in the customary manner.

In the drawings, four pairs of clamping jaws, equally spaced about the periphery of roller 10, are shown and the opening and closing of the jaws, as roll 10 rotates about its axis, is effected by operation of shafts 14 by means of stationary cam member 17 through lever arms 18 and cam followers 19, the lever arms being attached to one end of shaft 14 which extends beyond the end of the roll and cam 17 being secured by a side-frame of the folder.

The shafts 14 are rotatably supported at each end by the ends of the roll and extend longitudinally through channels 20 cut radially into the roll. The outer sides of these channels are partially closed by the longitudinally extending stationary jaws 11 and face plates 21, the outer surfaces of which are flush with the roll surface, and which are secured to the roll by means of machine screws 22, or other suitable means.

A cam follower 19 reaches the point 23 on cam 17, at the instant the corresponding jaws are at the bite between rolls 3 and 10 and the jaws are thereby closed and remain closed until that cam follower has arrived at the point 24 and are then opened to release the folded sheets to a roll which deposits them on a delivery table, not shown, in a customary manner.

It will be understood that the invention is not restricted to the particular number of pairs of clamping jaws or the particular jaw construction or mechanism for operat-

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ing those jaws, shown in a drawing, but contemplates other known types of jaws and mechanisms for operating the jaws.

The invention, as previously noted, resides primarily in the novel combination of a clamping jaw roll and a cooperating roll embodying improved and novel means for forcing the pages into the open clamping jaws. In conventional practice, this is accomplished by means of tucker blades positioned about the periphery of roll 8, as at points indicated at 25, to coincide with the clamping jaws.

As more clearly shown in Figs. 2 and 3, in lieu of the conventional tucker blades, I provide in the periphery of roll 8 at points 25, longitudinally extending jet orifices 26. These jet orifices may be a continuous longitudinally extending slot, as shown in Fig. 3, or may be composed of a row of closely spaced, aligned perforations extending through the periphery of roll 8. In any event, the over-all length of the jet orifices should be substantially coextensive with the width of the pages to be folded.

In accordance with a broader aspect of the invention, the gas orifices may extend through the periphery of roll 8, per se, being connected at their inner ends with a gas conduit leading to any convenient source of gas under pressure, air for instance, the flow of gas through the conduit being controlled by an automatically operated valve or valves, the operation of which is synchronized with the rotation of the rolls so that a jet of gas is shot from a jet orifice at the instant of coincidence of that orifice with the cooperating open jaws at the bite between rolls 8 and 10.

However, in a preferred embodiment of the invention shown in the drawing, I provide a longitudinally extending cheek wood 27 fitted snugly in housing 28 and forced outwardly by means of a spring 29, the outward movement of the cheek wood being limited by shoulders 30 to a distance usually not exceeding about $\frac{3}{32}$ of an inch beyond the periphery of roll 8. The outer surface of this cheek wood, though conforming generally to the curvature of roll 8, may with advantage be provided with a longitudinally extending protrusion 31 of a width approximating the distance between the jaws when in an open position.

The jet orifice or orifices 26 extend radially inwardly through the cheek wood at approximately the center portion of the protrusion 31 and are connected at their inner ends with a gas chamber 32 which is in open communication with gas chamber 33 extending through the housing 28 into the valve block 35. The lower end of chamber 33 is connected by valved conduit 36 with connecting conduits 37 and 38 which lead to a manifold 39 extending coaxially through the supporting shaft 40 of roll 8.

Shaft 40 is closed at both ends, but adjacent one end beyond the roll is provided with a radially extended conduit 41 leading from manifold 39 and adapted to cooperate with the segmental chamber 42 which is connected by conduit 43 to a source of gas under pressure. For the most part of the rotation of shaft 40 the outer end of conduit 41 is closed by stationary collar 44 fitted snugly about shaft 40 to prevent the escape of gas through conduit 41. The segmental chamber 42 is housed by collar 44 and during a minor portion of the rotation, while the outer end of conduit 41 opens into chamber 42, a gas pressure is built up within the conduits and chambers leading therefrom to the valve or valves 45 positioned in the connecting conduits 36.

The valve 45 comprises a longitudinally extending shaft fitted snugly but rotatably into valve block 35 and provided with diametrically extending bores 46 coinciding, when in the open position, with the connecting conduits 36. One end of said shaft 45 extends beyond the end of roll 8 and is connected by arm 47 with cam follower 48, adapted to cooperate with the stationary cam 49 secured to the folder side frame 50 by means of machine

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screws 51 extending through elongated slots 52 to permit cam adjusting and synchronizing thereof with the rotation of the roller.

In this embodiment of the invention, I have shown a plurality of gas chambers 33 each provided with a separate valved connecting conduit 36. The purpose of this is to effect a more uniform gas pressure throughout the jet orifice and better control of gas flow. However, the invention is not restricted to this particular arrangement of the gas distributing system.

The collar 44 may be secured to the side frame of the folder by any suitable means, for instance machine screws indicated at 53. The valve block 35 and the housing 28 may likewise be secured to roll 8 by any suitable means, for instance machine screws indicated at 54 and 55, respectively.

The cam member 17 of roll 10 may be secured, preferably adjustably, to the folder side frame by machine screws extending through elongated slots in the cam member, as indicated at 34, or by other suitable means.

In operation the cut, but unfolded, sheets 56 are carried by roll 8 into the bite between roll 8 and roll 10. The rotation of these rolls is so synchronized that one of the longitudinal air jets and one pair of clamping jaws meet at the bite, and the cam mechanisms are so synchronized that at this instant the clamping jaws are in an open position as shown in Fig. 2. Also a gas pressure, advantageously of the order of 100 lbs. per square inch or more, has been built up within the gas conduits and chambers preceding the valves 45 in roll 8. When the sheet, or sheets, to be folded has passed approximately halfway through the bite, the valve 45 is opened, as by automatic means previously described, and a jet of air is shot from jet orifice 26 against an intermediate portion of the sheet forcing it between the clamping jaws, and immediately thereafter the clamping jaws are closed and gas valve 45 is returned to the closed position.

In making the fold, the forward end of the sheet is impaled on pins 9. The rearward edges of the sheet are not held fast to the roller. Consequently, when the sheet is forced between the clamping jaws the rearward half of the paper is caused to move along the periphery of roll 8. Therefore, where it is desired that the forward and rear edges of the sheet coincide after folding, the operation just described should be performed at the moment when somewhat less than half of the sheet has passed through the bite between rolls 8 and 10.

In that aspect of the invention specifically described, in which cheek woods are used, the cheek wood is forced outwardly by means of the spring 29 so as to hold the paper firmly against stationary jaw 11 thus further preventing slippage between the forward end of the sheet and the periphery of roller 8 and more precisely controlling the effecting of the fold at the desired predetermined position. It is desirable that there be sufficient clearance between the cheek wood and the outer edge of moveable jaw 12 to permit slippage of the paper there-through. However, it is also desirable that this clearance be sufficiently small to effectively confine the gas jets thus increasing their effectiveness.

As previously noted, various valved conduit means may be provided for conducting gas under pressure to the jet orifices. However, it is desirable to avoid the possibility of continuing jet action in case the folder should be stopped with the gas valves in the open position. For this reason, I have provided means, as previously described, for building up a gas pressure within the roll 8 and automatically disconnecting conduit 41 from the source of gas during the period that valve 45 is in the open position. It will be understood, however, that the invention also contemplates the use of a continuous communication between manifold 39 and the source of the gas.

Following the closing of the clamping jaws on the folding sheet, the pins 9 impaling the forward edge of the

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sheet will be automatically retracted so as to free the folded sheet from roll 8. Automatic mechanisms for operating the various impaling pins are well known to the art and need not here be described. Following the release of the sheets from roll 8, they are carried by roll 10, as indicated at 57 and picked up by one or more delivery rolls, indicated at 58, by means of which the folded sheets are deposited on a delivery table.

I claim:

1. A folding mechanism comprising two cooperating folding rolls, a pair of longitudinally extending clamping jaws positioned in the periphery of one of the rolls, automatic means for opening and closing the jaws as the said roll rotates, a longitudinally extending jet orifice in the periphery of the other roll, the rotation of the two rolls being so coordinated that the jet orifice coincides with the opening between the jaws at the bite between the rolls, valved controlled means for supplying a gas under pressure to the orifice, automatic means for opening the valve in said conduit when the jet is coincident with the opening between the jaws and thereafter closing the valve, said means for controlling the valve and for controlling said jaws being so synchronized with the rotation of the rolls that the jaws are in the open position at the moment they become coincident with the jet and are closed immediately thereafter.

2. In conjunction with a folding mechanism comprising two cooperating folding rolls, a pair of longitudinally extending clamping jaws positioned in the periphery of one of the rolls, automatic means for opening and closing the jaws as said roll rotates and means for passing sheets of paper through the bite between the two rolls, improved means for forcing a portion of the sheet intermediate its length between the open jaws which comprises a longitudinally extending jet orifice in the periphery of the second roll, a valved conduit leading from the inner end of the orifice and adapted to be connected with a source of gas under pressure and automatic means for opening the valve in said conduit when the orifice is coincident with the open jaws, the rotation of the two rolls being so coordinated that the orifice coincides with the jaws at the bite between the roll.

3. In conjunction with a folding mechanism comprising two cooperating folding rolls, a pair of longitudinally extending clamping jaws positioned in the periphery of one of the rolls, automatic means for opening and closing the jaws as said roll rotates and means for passing sheets of paper through the bite between the rolls, improved means for forcing a portion of the sheet intermediate its length between the open jaws which comprises a cheek wood extending longitudinally of the other roll and embedded in the periphery thereof, yieldable means for holding the cheek wood in a position such that its outer surface extends outwardly slightly beyond the periphery of the roll, a longitudinal jet orifice extending

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radially inwardly through the cheek wood, a valved conduit leading from the inner end of said orifice and adapted to be connected with a source of gas under pressure and automatic means for opening the valve in said conduit when the orifice is coincident with the open jaws, the rotation of the two rolls being so coordinated that the orifice coincides with the jaws at the bite between the rolls.

4. In conjunction with a folding mechanism comprising two cooperating folding rolls, a pair of longitudinally extending clamping jaws positioned in the periphery of one of the rolls, automatic means for opening and closing the jaws as said roll rotates and means for passing sheets of paper through the bite between the rolls, improved means for forcing a portion of the sheet intermediate its length between the open jaws which comprises a longitudinally extending jet orifice in the periphery of the other roll, a gas chamber positioned within the said roll and adapted to retain gas under pressure, a valve conduit leading from the inner end of the orifice to said chamber, automatic means synchronized with the rotation of the roller for opening the valve in said conduit when the orifice is coincident with the open jaws and means for supplying gas under pressure to the chamber within the roll.

5. The apparatus of claim 3 in which the outer surface of the cheek wood is provided with a longitudinally extending protrusion of a width approximating the distance between the clamping jaws when in the open position.

6. The apparatus of claim 3 in which one of the clamping jaws is stationary, having an outer surface flush with the periphery of the roller within which it is positioned, the cheek wood of the cooperating roll being adapted to hold the sheet firmly against the periphery of said stationary jaw, to prevent movement of the forward end of the sheet with respect to the roll, while the sheet is being forced between the open clamping jaws.

7. The apparatus of claim 1 in which the jet orifice is a continuous longitudinally extending slot.

8. The apparatus of claim 1 in which the jet orifice consists of a plurality of closely spaced longitudinally aligned perforations.

9. The apparatus of claim 1 in which the means for supplying gas to the orifice comprises a manifold extending longitudinally through the roll and a plurality of valve controlled conduits uniformly spaced over the length of the roll leading from the manifold to corresponding sections of the orifices.

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