

Aug. 2, 1932.

D. W. HUDSON

1,869,694

WEB FOLDER

Filed July 20, 1931

2 Sheets-Sheet 1

FIG. 1.

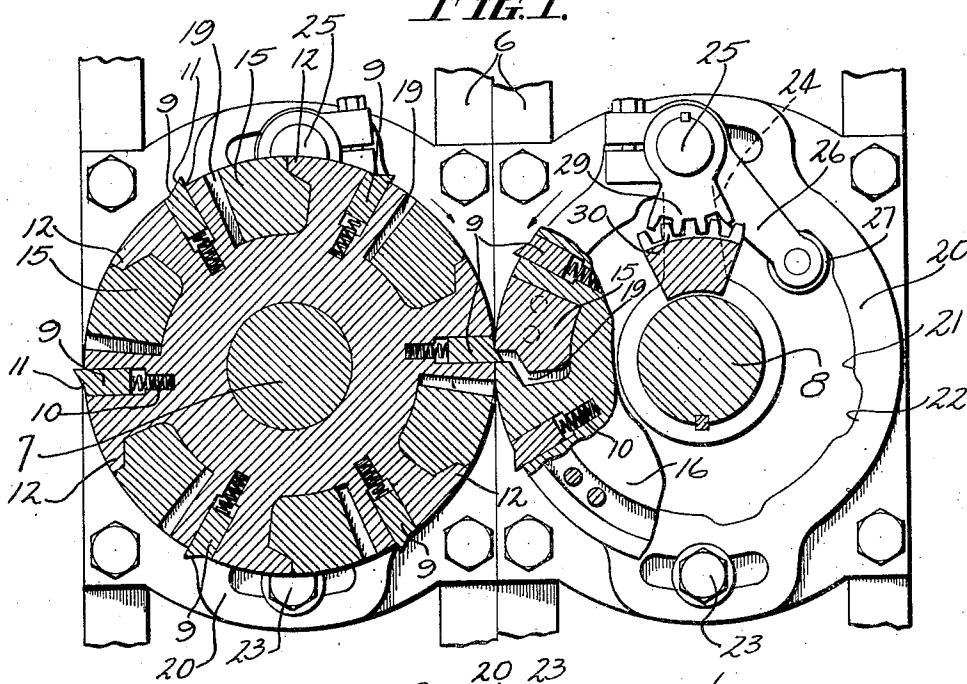
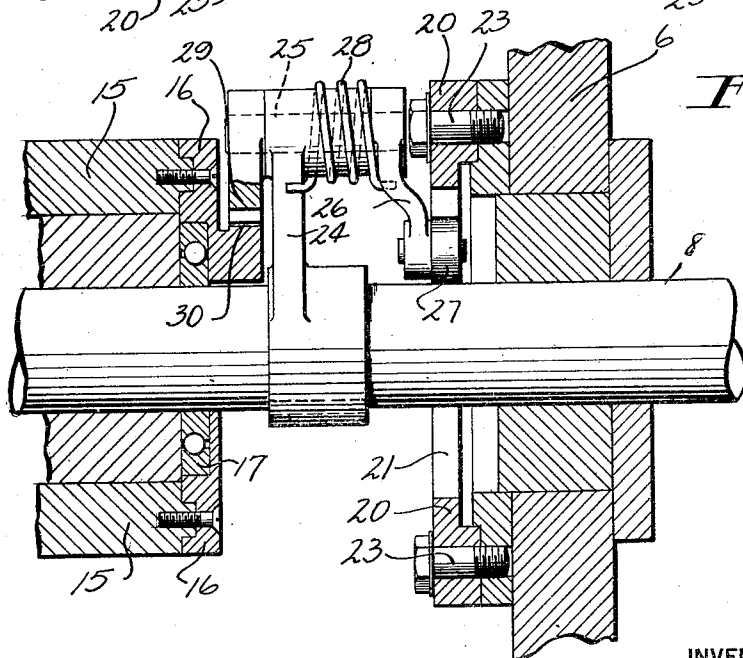


FIG. 2.



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FIG. 3.

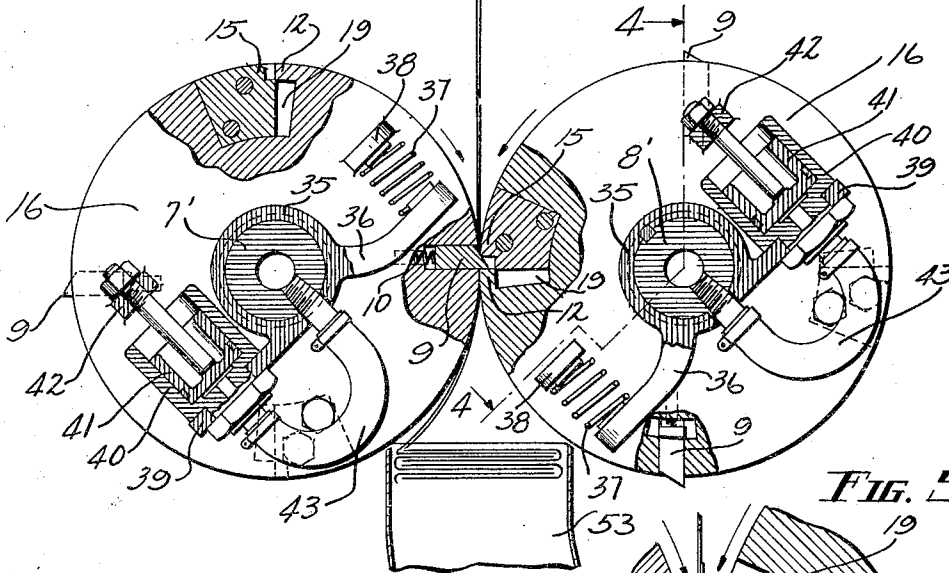


FIG. 5.

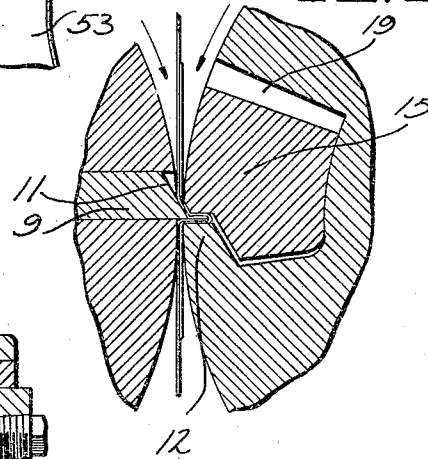
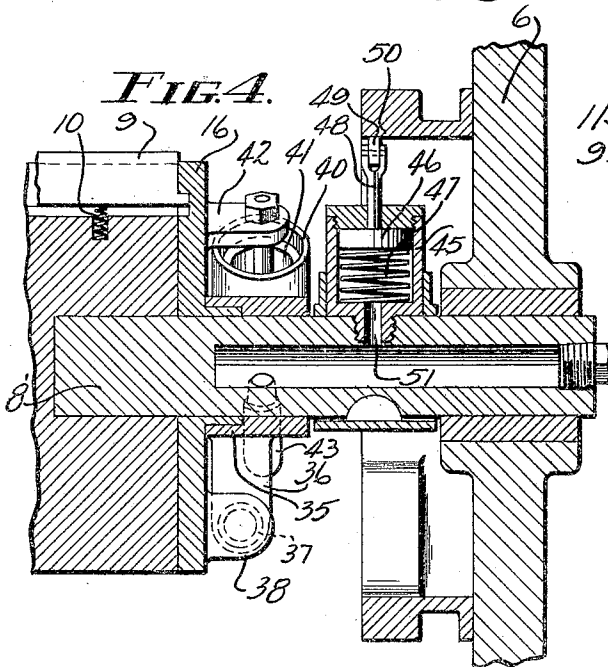


FIG. 4.



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WEB FOLDER

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This invention relates to improvements in web folders. It has particular application to interfolding machines but may also be used for other folding operations.

5 It is the primary object of the invention to provide simplified web folding apparatus in which separate actuating connections for each set of folding jaws may be dispensed with and all jaws of a given set operated
10 simultaneously through a single actuating mechanism.

It is another object of the invention to provide a folding device in which no actuating connections are required for the tucking
15 blades, the design of the parts being such that the tucking blade is expelled automatically by the clamping jaws as they engage the folded web. Other objects of the invention relate to the provision of an arrangement
20 for the use of fluid pressure (which may include atmospheric pressure) for the actuation of the moving parts of a web folder.

In the drawings:

25 Figure 1 is a diagrammatic illustration of web folding apparatus partially in transverse section, one part of the apparatus being quite largely broken away to expose the actuation connections therefor.

30 Figure 2 is a vertical axial section through an end portion of one of the rolls shown in Figure 1 and the supporting frame and actuating connections for the folding parts.

35 Figure 3 is a diagrammatic view partially in end elevation and partially in section showing a set of folding rolls and the actuating connections therefor, the mounting frame being omitted.

40 Figure 4 is a detail view taken in section on the line indicated at 4—4 in Figure 3.

45 Figure 5 is a fragmentary detail showing how a tucking blade is expelled by folding jaws made in accordance with this invention in the course of the operation of said jaws upon the material to be folded.

Like parts are identified by the same reference characters throughout the several views.

50 The device includes a frame 6 in which the supporting shafts 7 and 8 are rotatably mounted. They are, of course, synchronized

by the usual gearing which is common in such devices and is not here illustrated.

Each of the rolls is provided at intervals about its periphery with one or more tucking
65 blades 9. Commonly these blades are mechanically projected and retracted by individual actuating connections. In accordance with the present invention, however, each blade is mounted for a limited radial reciprocation under the compression of
70 spring 10. The projecting end portion of each blade is beveled as shown at 11.

Midway between successive blades on the periphery of each roll are relatively fixed
75 clamping jaws 12 which may be integral with the roll and with which the flat side surface of a tucking blade 9 in the other roll is adapted to interact as shown in Figure 1. The arrangement follows the usual practice in that
80 the thrust of the web by a tucker blade on the first roll into the clamping jaws of the second roll is followed by an operation on the web in which a tucking blade of the second roll thrusts the paper into the complementary
85 jaws of the first roll.

Coacting with each of the fixed jaws 12
90 is a movable jaw 15 comprising a heavy bar supported at its end by ring 16 which is mounted for oscillation on anti-friction bearings 17 to a limited circumferential extent. Relative movement between the end
95 rings 16 and the bodies of the rolls to which said rings are applied will cause the movable jaw bars 15 to oscillate to and from the fixed jaws 12 to the extent permitted by the
100 longitudinal slots 19 in which the respective jaw bars 15 are disposed.

The coacting faces of the movable jaw bars 15 and the jaws 12 which are integral
105 with the rolls are substantially radial. When the jaw bars are oscillated with respect to the bodies of their respective rolls by the mechanism hereinafter to be described they leave an opening with which the normally projecting tucker blades 9 will register
110 in the rotation of the rolls. The tucker blades thrust the web into this opening as shown in Figure 5 and the ensuing movement of the jaw bars 15 into clamping engagement with the roll jaws 12 acts upon the abruptly
115

inclined wedge surface 11 of the active tucking blade 9 to expel the tucking blade as also shown in Figure 5.

Figure 1 shows the tucker blade of the left hand roll engaged between widely separated creasing jaws of the right hand roll. In order to operate the moving jaw bar 15 to the clamping position shown in Figure 5 it is necessary to produce movement between the end ring 16 of the right hand roll and the body of the roll itself. Means for effecting this movement will now be described.

In the construction shown in Figures 1, 2 and 5, the desired movement is brought about through purely mechanical means. A ring 20 having an internal peripheral cam surface 21 radially relieved at 22 is adjustably fixed to the machine frame 6 by means of bolts 23. An arm 24 fixed to shaft 8 (the structure being duplicated for the roll carried by shaft 7) supports a rock shaft 25 having an arm 26 carrying a cam follower roller 27 which follows the cam surface 21 and is held thereto by a torsion spring 28. The rock shaft 25 carries a gear segment 29 co-acting with a gear segment 30 mounted on the ring 16, the arrangement being such that as the cam follower roller 27 rides into one of the relieved portions or notches 22 in the cam shaft 25 it is caused to oscillate to an extent sufficient to shift the end ring 16 with respect to the body of the roll and thereby to move to open position all of the jaw bars 15 with which the given roll is provided.

Since this operation is effected by the rotation of the roll it may be synchronized with the entry of tucking blade 9 into the clamping space thus provided and when the cam follower roller moves out of the notch 22, the pressure of the cam will positively oscillate rock shaft 25 and ring 16 in a converse direction with respect to the roll whereby to expel the tucking blade and crease the folded web.

It is particularly to be noted that the clamping jaws are normally closed and are only opened for a sufficient time to receive the coacting tucking blade and the web folded thereby into the space between the jaws. As soon as the tucking blade is expelled, the jaws remain closed until the roll has rotated to the position where the creased web is to be expelled. The fact that all of the movable jaws of the creasing devices of a given roll are operated simultaneously makes it possible to deliver the creased web from one set of jaws when the next set is open to receive another portion of the web. Since the tucking and creasing take place alternately in alternate rolls, the web will be folded in opposite directions, as shown in Figure 3, as is usual in interfolding machines. It may be otherwise folded, if desired, for other purposes.

In Figures 3 and 4 I have illustrated one

means for the fluid actuation of the parts. In this construction the rolls are provided with relatively fixed jaw surfaces 12 and with longitudinal channels 19 in which clamping jaw bars 15 are peripherally adjustable with respect to the fixed jaws 12 as above explained. The tucking blades 9 are beveled and yieldably projected radially by compression springs 10 as set forth above. The movable jaws are supported on end rings 16 which are peripherally adjustable with respect to the body of the roll.

For effecting the desired adjustment of the end rings and clamping jaw bars in this device I provide a sleeve 35 fixed to each operating shaft 7' and 8', the shafts being made hollow to admit the fluid used to effect the relative movement of the parts. An arm 36 on sleeve 35 seats a compression spring 37 bearing against a lug 38 on the end ring 16. A second arm 39 on sleeve 35 carries a cylinder 40 in which operates a piston 41 connected with a second lug 42 on the end ring 16. A pipe 43 leads from each cylinder to the hollow center of its respective shaft.

Instead of using valve mechanism for the supply and relief of pressure from some accumulated source I prefer to accumulate and relieve the pressure as required through the medium of a cylinder 45 carried by the shaft and containing a piston 46 pressed outwardly by a spring 47 and actuated in an inward direction by a piston rod 48, a cam follower 49 and a cam 50 on the frame 6. The cylinder communicates through a port 51 with the hollow interior of the shaft, which is plugged at its end to provide a closed circuit. If a liquid is used in the circuit it establishes an incompressible means of transmitting motion from the downward stroke of piston 46 to produce a corresponding outward stroke of piston 41 whereby the clamping jaw bars 15 may be positively pressed toward the roll jaws 12 in the course of rotation of the rolls.

Whether the rolls be provided with two clamping jaws as shown in Figure 3 or six clamping jaws as shown in Figure 1 or any other desired number, the tucking blades of the companion rolls may be made to interact as desired and the simultaneous operation of all jaws of a given roll from a normally closed position to a momentarily open position will not only receive the tucking blade and web at the creasing point but will release a previously creased web into the packaging chute 53.

It will be noted that great simplification has been achieved in the present machine as compared with a device where the several component parts are separately and independently operated.

I claim:

1. Folding apparatus comprising a support providing a plurality of jaws, means

mounting said support for rotation and a plurality of relatively movable jaws mutually interconnected and simultaneously movable to and from clamping engagement with respect to the several first mentioned jaws.

2. Folding mechanism comprising a folding roll provided with a plurality of jaws and with longitudinal channels adjacent each jaw, coacting jaw bars in the several channels provided with peripheral clearance therein for relative peripheral movement to and from the first mentioned jaws, means interconnecting said jaw bars for simultaneous movement and means for actuating said jaw bars with respect to their several associated jaws first mentioned.

3. Web creasing apparatus including a rotor provided with a set of peripherally spaced jaws and with longitudinal channels adjacent the several jaws, jaw bars peripherally adjustable in their respective channels to and from operative clamping engagement with respect to the several jaws first mentioned, a ring connecting said jaw bars for simultaneous movement with respect to said rotor and means for oscillating said ring and jaw bars with respect to said rotor in the course of the rotation of the rotor.

4. Folding mechanism comprising the combination of a plurality of rotors, one of which is provided with clamping jaws relatively movable in a circumferential direction and the other of which is provided with a radially yieldable tucker blade normally projected for entry between said jaws, the extremity of said blade being beveled at such an angle that said blade is expelled from said jaws by the clamping pressure thereof in the course of a relative closing movement of said jaws.

5. Folding mechanism comprising the combination of a plurality of rotors, relatively peripherally movable clamping jaws carried by each rotor, relatively radially movable tucking blades carried by each rotor in a position to coact with the clamping jaws of the other rotor and provided with beveled ends for expulsion by the clamping of the jaws coacting therewith, and springs yieldably supporting the respective tucking blades in a position of radial projection for interaction with said jaws.

6. Folding apparatus including the combination with a rotor provided with a plurality of sets of clamping jaws, one jaw of each set being relatively fixed respecting said rotor and the other jaw of each set being relatively peripherally movable respecting said rotor and a second rotor associated with the first and provided with a normally projecting yieldably mounted tucker blade arranged for projection between the jaws of said first mentioned rotor and beveled to be expelled by clamping pressure of said jaws.

7. Folding apparatus including the combination with a rotor provided with a plural-

ity of sets of clamping jaws, one jaw of each set being relatively fixed respecting said rotor and the other jaw of each set being relatively peripherally movable respecting said rotor, and a second rotor associated with the first and provided with a normally projecting yieldably mounted tucker blade arranged for projection between the jaws of said first mentioned rotor and beveled to be expelled by clamping pressure of said jaws, the several relatively movable jaws of said first mentioned rotor being interconnected for simultaneous movement to and from clamping relation to their respective relatively fixed jaws.

8. In a folding mechanism the combination with a rotary support and a jaw relatively fixed respecting said support, of a second jaw movable respecting said support to and from operative clamping relation to the first mentioned jaw, means rotatable with reference to said support and with which said second jaw is connected, a rock shaft rotatable with said support and provided with actuating connections for rotating said means with reference to the support, a cam follower carried by said rock shaft, and a cam with reference to which said support is rotatable and with which said cam interacts for actuating the relatively movable jaw.

9. Web folding mechanism comprising the combination with a rotor provided with a plurality of jaws relatively fixed with reference thereto and a plurality of jaws respectively associated with said first mentioned jaws and movable with respect to said rotor to and from clamping engagement with said first mentioned jaws, means rotatable with respect to said support and connecting said movable jaws for simultaneous movement, a rock shaft provided with a bearing rotatable with said support and remote from the axis thereof, motion transmitting connections between said rock shaft and means, and cam mechanism operative in the rotation of said support for oscillating said rock shaft and thereby opening and closing the respective jaws.

10. Folding mechanism comprising the combination with a rotatable support, of a plurality of sets of relatively movable jaws carried thereby, means interconnecting the movable jaws of said sets for simultaneous clamping and releasing movement and including a single set of actuating connections for the interconnected movable jaws.

11. Folding mechanism comprising the combination with a rotatable support, of a plurality of sets of relatively movable jaws carried thereby, means interconnecting the movable jaws of said sets for simultaneous clamping and releasing movement and a single set of actuating connections for the interconnected movable jaws, said connections including complementary operating parts and means for maintaining said jaws

normally closed in the rotation of said support and opening said jaws at predetermined intervals in the rotation of said support for the discharge from one set of jaws of material creased therein and the reception in another set of jaws of material to be creased.

12. Folding mechanism comprising the combination with a rotatable support, a plurality of sets of relatively movable clamping jaws and means interconnecting the movable jaws of said sets for simultaneous movement, of means for actuating the movable jaws of said sets in a direction away from their associated jaws periodically in the course of rotation of said support, and means providing a tucking blade arranged to enter between the separated jaws of one set to thrust therein a web to be creased while the jaws of a preceding set are open for the discharge of creased material.

13. Folding apparatus comprising a pair of relatively movable creasing jaws and actuating connections for one of said jaws including fluid pressure responsive means and a fluid pressure line and means for periodically applying pressure to the fluid in said line and said means to actuate said jaws.

14. Folding mechanism comprising a rotor, a fluid pressure line coaxial therewith, a pair of relatively movable jaws carried by the rotor, pressure responsive means communicating with said line and connected with said jaws for the operation thereof, and means for periodically subjecting said line to fluid pressure for the operation of said jaws.

15. In a folding device the combination with a rotor, relatively movable clamping jaws thereon and a pressure responsive device connected with one of said jaws for the actuation thereof, of a line leading to said device, a displacement member operatively connected with said line, fluid in said line adapted to transmit to said device the movement of said member and means operable on said member in the rotation of said rotor for alternately displacing and relieving said member.

16. In a folding device the combination with a rotor provided with folding means movable with reference to the rotor, of a hydraulic actuating mechanism mounted for bodily rotation with said rotor and including a pressure responsive device, a pressure developing device and a hydraulic line connecting said device; and means including a part with reference to which said rotor turns for actuating said pressure developing device.

17. Folding means comprising the combination with a rotor and folding mechanism thereon, of a self-contained hydraulic actuating unit mounted to turn with said rotor and including a pair of cylinders, a communicating line, a piston in one of said cylinders connected with a movable part of said folding mechanism, a piston in the other of said cyl-

inders provided with actuating connections including a cam follower and a stationary cam with respect to which said rotor turns and with which said rotor coacts for the operation of said mechanism.

18. Folding apparatus comprising the combination with a rotor and folding mechanism carried thereby, of hydraulic actuating means for said folding mechanism including a cylinder on said rotor, a piston connected with a movable part of said mechanism and reciprocable in the cylinder, a line coaxial with said rotor, and means for intermittently subjecting said line to pressure for the operation of said mechanism in the course of rotor rotation, and means for intermittently relieving said line of pressure for the reverse operation of said mechanism.

19. The combination with clamping jaws of tucking means including a spring pressed portion yieldably mounted, receivable between said jaws and beveled for expulsion by the clamping action of said jaws.

20. In a device of the character described tucking means comprising a blade having a beveled edge, a guide on which said blade is yieldable away from a point of application of pressure on said edge and means for yieldably supporting said blade in operative tucking position.

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