Nov. 13, 1928. 1,691,606

R. HITCHCOCK

SHEET DETECTOR FOR PAPER FEEDING MACHINES.

Filed March 11, 1925

FIG. 1

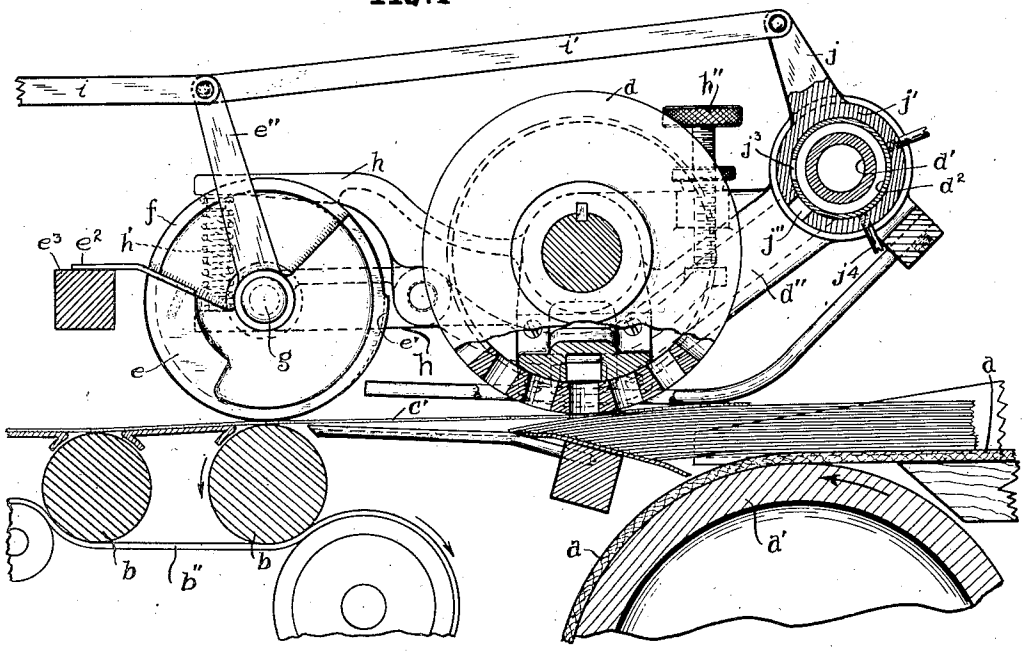


FIG. 2.

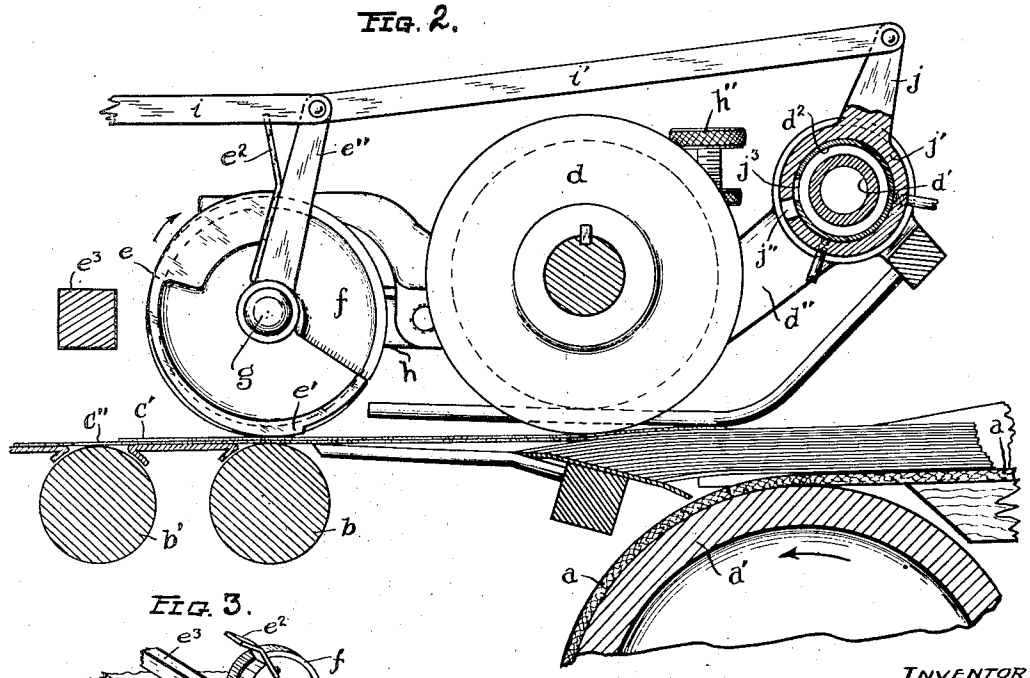
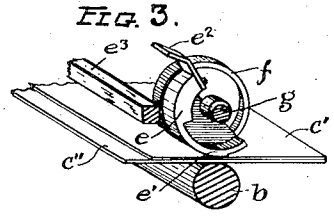


FIG. 3.



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REUBEN HITCHCOCK, OF CLEVELAND, OHIO, ASSIGNOR TO THE CLEVELAND FOLDING MACHINE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

SHEET DETECTOR FOR PAPER-FEEDING MACHINES.

Application filed March 11, 1925. Serial No. 14,672.

My invention relates to improvements in sheet detector for paper-feeding machines and has for its object the provision of a simple and efficient device for preventing the passage and feeding of more than one sheet at a time.

Paper-feeding machines of necessity must be so equipped when associated with automatic means, that the sheets will be advanced singly to the associated folding or printing appliance; otherwise material and unnecessary losses of paper stock will be entailed. Obviously extreme sensitiveness and accuracy are demanded in a sheet detector provided to guard against duplicate feeding, while prompt flexibility of adjustment is required to adapt the sheet detector for use with different classes and thicknesses of paper stock.

It has been my purpose fully to meet the exacting requirements of a sheet detector when subjected to varying commercial use in association with different classes of apparatus; the same essentially comprising a sensitive adjustable member that will permit the rapid passage of single sheets while checking the advance of, but immediately releasing in unmarked condition, two or more sheets and preferably rendering inoperative the associated sheet-feeding mechanism until the appliance has been cleared of the duplicate sheets and reset for normal operation.

Details of my improved sheet detector may best be explained in connection with the accompanying drawings showing it in one of its its adaptations and of preferred form, wherein:

Figure 1 is a view, partially in side elevation and partially in longitudinal section, showing the sheet detector in association with sheet-feeding means or elements under conditions of normal operation,

Fig. 2 is a similar view thereof showing the actuation of the sheet detector by two superposed sheets of paper, whereby the feeding mechanism has been rendered inoperative, and

Fig. 3 is a perspective view, somewhat diagrammatic in character and upon a smaller scale, illustrating the pinching action of the eccentric portion of the detector previous to its rotation for freeing the engaged sheets.

Throughout the several figures of the drawings I have employed the same character of reference to indicate similar parts.

At the right of both figures of the drawings are shown in fragmentary form a belt or band feeder a advanced by the roll a', while at the left there are sectionally shown two rollers b, b' of a table for conveying the sheets from right to left. The rollers of the conveyor table are rotated by the underrunning belt b'' in counter clockwise direction. A stack of paper in fanned-out arrangement is shown upon the belt a, the top sheet c' of which has been advanced by the rotary suction head d toward the left beneath the sheet detector and upon the rollers b, b' in accordance with the normal operation of the apparatus.

I have chosen for illustration a pneumatic suction member; the same being rendered operative by the suction applied from pipe d' through the hollow arm d'' and its interior extension d^2 to the openings in the rotary suction head d. However, it should be understood that other means for advancing the sheets to the sheet detector are contemplated by my invention, and, in consequence, other associated means for rendering the feeding mechanism inoperative.

The sheet detector appliance comprises the overweighted sector e rotatable, however, in common with the independent idler f upon shaft g and adjustably positioned immediately above the roller b normally driven to advance the sheets upon the feed table at the left of the drawing. The adjustment of members e and f is attained by means of their pivoted supporting arm h, tensioned at the left by the coiled spring h' and adjusted at the right by the screw device h''. By this means the detector is vertically adjustable with respect to the co-acting roller b in accordance with the thickness of the particular paper stock that is being fed by the sheet-feeding mechanism. This adjustment is carefully made barely to clear roller b by the thickness of a single sheet of paper so that its passage will not be impeded in the normal operation of this mechanism.

It will be observed that the righthand portion e' of the sector e (Fig. 1) is of slightly increasing diameter. Otherwise members e and f are concentric and of equal diameter; the position of their supporting bearing being

indicated by the dotted circle (Fig. 1) surrounding shaft g. Immediately upon the passage of two or more sheets between the sector and roller b, however, the former is frictionally rotated in clockwise direction until the enlarged portion e' pinches the paper against roller b with such force as to throw the connected arm e'' toward the right together with the links i, i' and the lever j of the valve member j', thereby gradually opening its port at j'' until the overriding eccentric portion e' has passed beyond the roller b when the port is fully opened. This releases the suction from the rotary suction head d which immediately renders the feeding mechanism inoperative and discontinues the feeding of the sheets. Moreover, the actuating sheets are immediately released from beneath the overriding eccentric portion, which is relatively short and abruptly terminated, so that the under sheet will not be marked by the continuously rotated roller b.

Obviously any other means for rendering such feeding mechanism inoperative may be connected with the links i, i' or with the arm e'', but it will not be necessary to go into further detail in these respects for the purpose of explaining my instant improvements.

An important feature to be considered in this connection is the momentary pinching of a plurality of sheets sufficiently to actuate the disabling means, which in the construction shown is the suction-controlling valve. The port j'' is shown in Fig. 2 approaching registry with the inner port j^3 and the continued rotation of the valve member j' serves completely to cut off the suction; the stop j^4 limiting the clockwise rotation of the valve. The pinching action obtained between the eccentric e' and the roller b is sufficient to impart the necessary power to the disabling means as previously indicated, but the sheets are released from pressure immediately the eccentric portion e' has passed beyond the roller b, thereby preventing the marking of the detained sheets by the continued rotation of roller b. This is of real advantage in preserving the appearance of the sheets or signatures as they are handled in transit.

When the duplicating actuating sheets have been cleared or removed from between the members e and b, Fig. 2, the arm e'' with its connected members may be moved toward the left until the stop e^2 rests upon its abutment e^3, thereby restoring the mechanism to its operative relation of Fig. 1. The sheets will be picked up and advanced one by one by the rotary suction head d, readily passing between roller b and the smaller or non-eccentric portion of sector e. The provision of a slightly eccentric portion or area e' upon the rotatable sector affords positive means for applying sufficient force to the connected disabling means whenever two or more sheets become pinched between area e' and the rotating roller b. The operative relation of these members is very readily adjusted by means of the screw device h'' in accordance with the requirements for feeding sheets of widely varying thickness.

Not only is the apparatus above shown and described of very simple and dependable character, but it is extremely sensitive or responsive to variations in thickness of the conveyed sheets, so that extremely thin paper stock may be handled without waste. Moreover, the adjustment is readily and directly accomplished merely by turning and locking the single screw provided therefor. By reason of the provision of a short overriding eccentric portion upon the rotary detector member, adapted momentarily to engage and release a plurality of inadvertently entered sheets, an additional impulse is afforded for actuating the associated disabling means, while the sheets are left unmarked, as would take place if they were forced against the face of the rotating roll and held by the opposing member in wedging relation. Thus my improved detector mechanism is rendered more efficient and certain in its action, while damage to the withheld sheets is avoided.

Having now described the preferred embodiment of one form of my improved device and sufficient co-operative mechanism to explain the principle and use thereof, I claim as new and desire to secure by Letters Patent, together with such modifications as may be made by the exercise of expected skill in the art, the following:

1. In mechanism of the class described, the combination with two co-operative rotatable testing members between which a sheet of paper is adapted to be passed, of means for effecting their relative adjustment toward and from each other corresponding with the thickness of the paper; one of said members having an abruptly-terminated overriding eccentrically related portion adapted to engage a plurality of interposed sheets, and disabling means operated upon the actuation of the latter member, substantially as set forth.

2. In mechanism of the class described, the combination with a driven roller member, of a rotatably mounted testing member opposing the same and having an abruptly-terminated overriding eccentric portion normally turned away from the first-named member, means for adjusting the separation of said members to correspond with the thickness of paper in transit therebetween, and disabling means associated with said testing member and adapted to be operated thereby when the eccentric portion is engaged by the paper, substantially as set forth.

3. In mechanism of the class described, the combination with sheet-feeding means, of a sheet detector associated therewith, comprising two rotatable opposing members between which the sheets are adapted to be for-

warded, means for adjusting said members to correspond with the thickness of the particular sheets in transit; one of said members having a short overriding protruding portion adapted to be engaged momentarily and released by a plurality of sheets in transit, and disabling means interposed between the latter member and the sheet-feeding means, adapted to be actuated by the passage of a plurality of such sheets, substantially as set forth.

4. In mechanism of the class described, the combination with sheet-feeding means, of a sheet detector associated therewith, comprising two adjustably spaced rotatable members, means for approximating said members to correspond with the thickness of the particular sheets in transit; one of said members being normally driven to advance the sheets and its opposing member having an abruptly terminated overriding eccentric portion adapted to pinch a plurality of introduced sheets, and associated means actuated by the latter member for rendering the sheet-feeding means temporarily inoperative, substantially as set forth.

5. In mechanism of the class described, the combination with sheet-feeding means, of a sheet detector associated therewith, comprising a driven roller and an adjacent testing member pivoted freely to rotate and having an abruptly-terminated overriding eccentric portion adapted momentarily to engage and pinch a plurality of sheets in transit, means for adjusting the separation of the detector members to correspond with the thickness of the sheets being fed, and disabling means interposed between the sheet-feeding means and the testing member adapted to be operated by the latter, substantially as set forth.

6. In mechanism of the class described, the combination with two co-operative testing members between which a sheet of paper is adapted to be passed, of means for effecting their relative adjustment toward and from each other corresponding with the thickness of the paper; one of said members having an abruptly-terminated overriding eccentrically related portion adapted rotatably to engage momentarily and release a plurality of sheets, and disabling means operated upon the actuation of the latter member, substantially as set forth.

7. In mechanism of the class described, the combination with a driven roller member, of a rotatably mounted testing member opposing the same and having an eccentric portion normally turned away from the first named member, means for accurately adjusting the separation of said members to correspond with the thickness of the paper in transit therebetween, a co-operating idler roller, and disabling means associated with said testing member and adapted to be operated when its eccentric portion momentarily is rotated to engage and release the passing sheets, substantially as set forth.

8. In mechanism of the class described, the combination with sheet-feeding means, of a sheet detector associated therewith, comprising a driven roller, an opposing idler and an adjacent testing member pivoted freely to rotate and having an eccentric portion adapted to engage a plurality of sheets in transit, means for accurately adjusting the separation of the detector members to correspond with the thickness of the sheets being fed while permitting the eccentric portion to pass the driven roller, and disabling means interposed between the sheet-feeding means and the testing member adapted to be operated by the latter, substantially as set forth.

9. In mechanism of the class described, a sheet detector appliance comprising a driven roller, a relatively adjustable testing member loosely pivoted freely to rotate with the driven roller having an abruptly terminated overriding eccentric portion adapted to engage and release a plurality of sheets in transit, and means for accurately adjusting the relative position of said members.

10. In mechanism of the class described, a sheet detector appliance comprising a driven roller, an opposing idler and an adjacent testing member loosely pivoted freely to rotate with the driven roller having an abruptly terminated overriding eccentric portion adapted to engage and release a plurality of sheets in transit, and means for accurately adjusting the relative position of said roller and testing member.

11. In mechanism of the class described, a sheet detector appliance comprising a driven roller and a co-operative testing member loosely pivoted freely to rotate with said roller; said member having a short overriding eccentric portion adapted to engage and release a plurality of sheets in transit, and means for adjusting the operative position relatively of said roller and testing member.

In testimony whereof I do now affix my signature.

REUBEN HITCHCOCK.