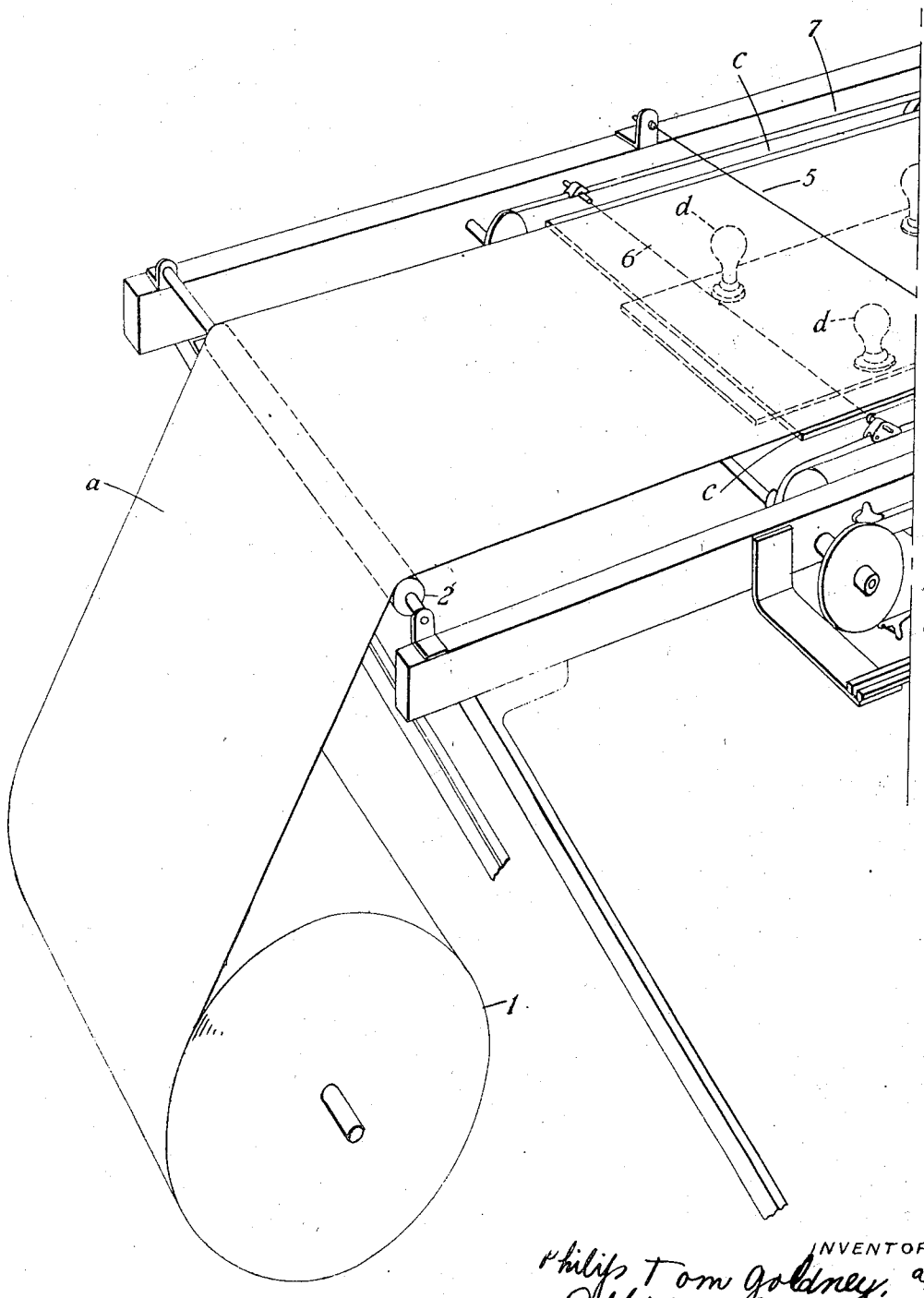
May 11, 1943. P. T. GOLDNEY ET AL 2,318,937

CUTTING AND SORTING OF PAPER AND LIKE SHEETS FROM CONTINUOUS WEBS

Filed June 24, 1941 6 Sheets-Sheet 1

Fig. 1.



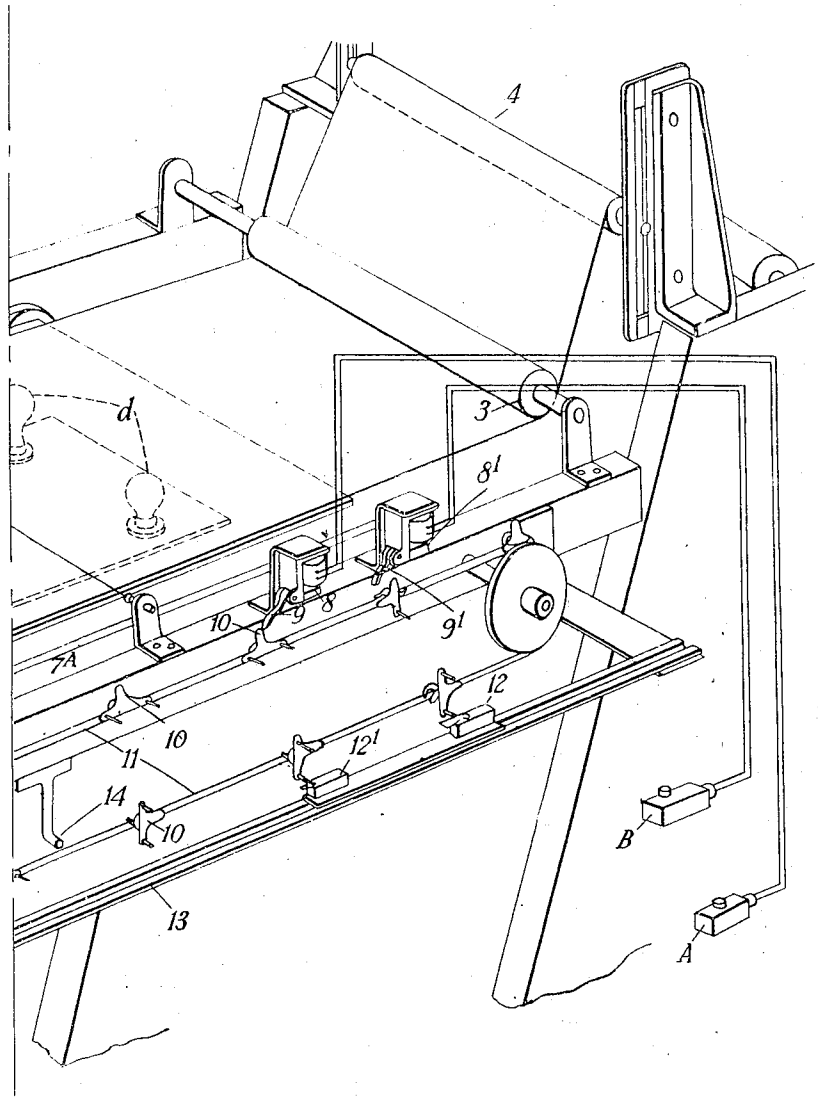
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CUTTING AND SORTING OF PAPER AND LIKE SHEETS FROM CONTINUOUS WEBS

Filed June 24, 1941 6 Sheets-Sheet 2

Fig. 1.a.



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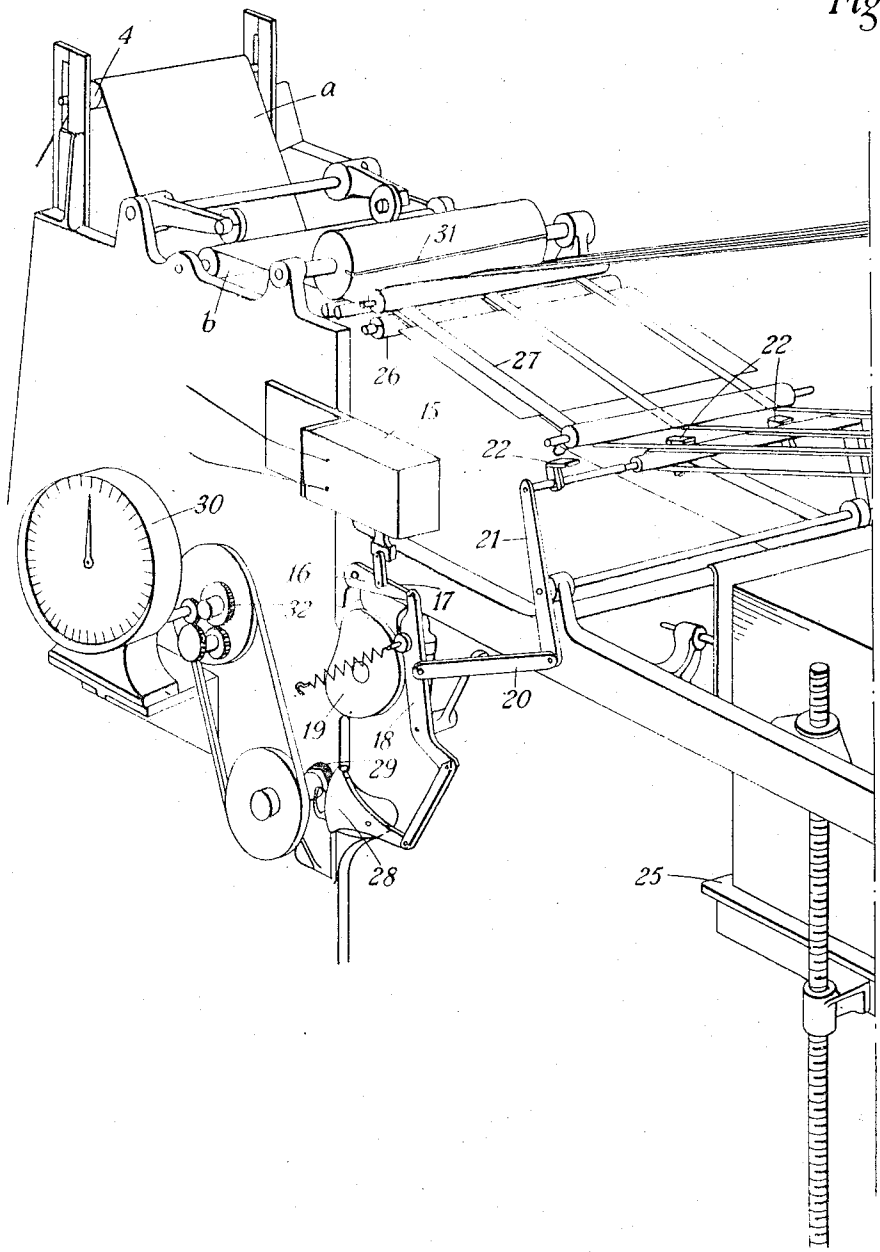
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CUTTING AND SORTING OF PAPER AND LIKE SHEETS FROM CONTINUOUS WEBS

Filed June 24, 1941 6 Sheets-Sheet 3

Fig. 2.



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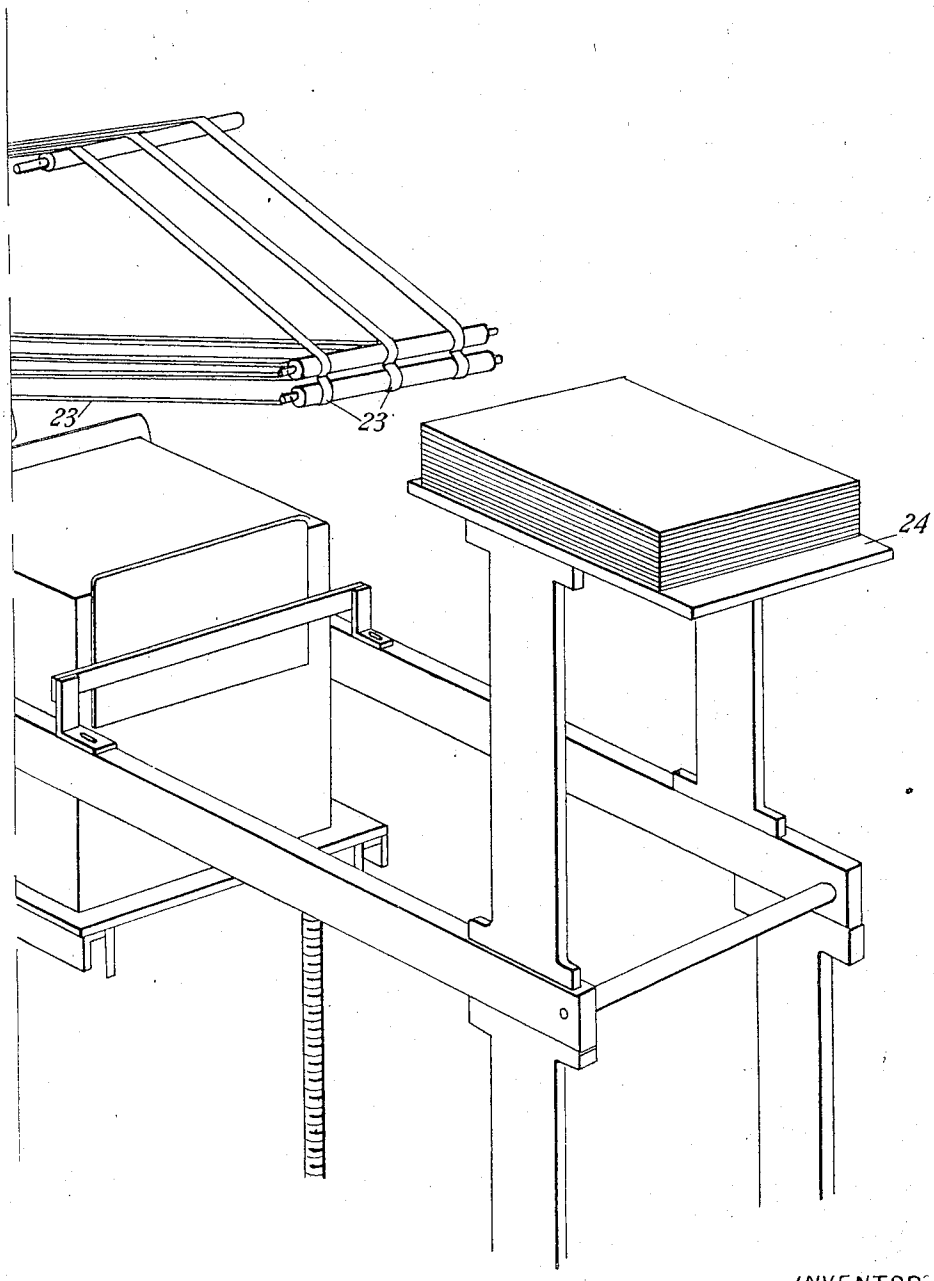
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CUTTING AND SORTING OF PAPER AND LIKE SHEETS FROM CONTINUOUS WEBS

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Fig. 2.a.



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CUTTING AND SORTING OF PAPER AND LIKE SHEETS FROM CONTINUOUS WEBS

Filed June 24, 1941 6 Sheets-Sheet 5

Fig. 3.

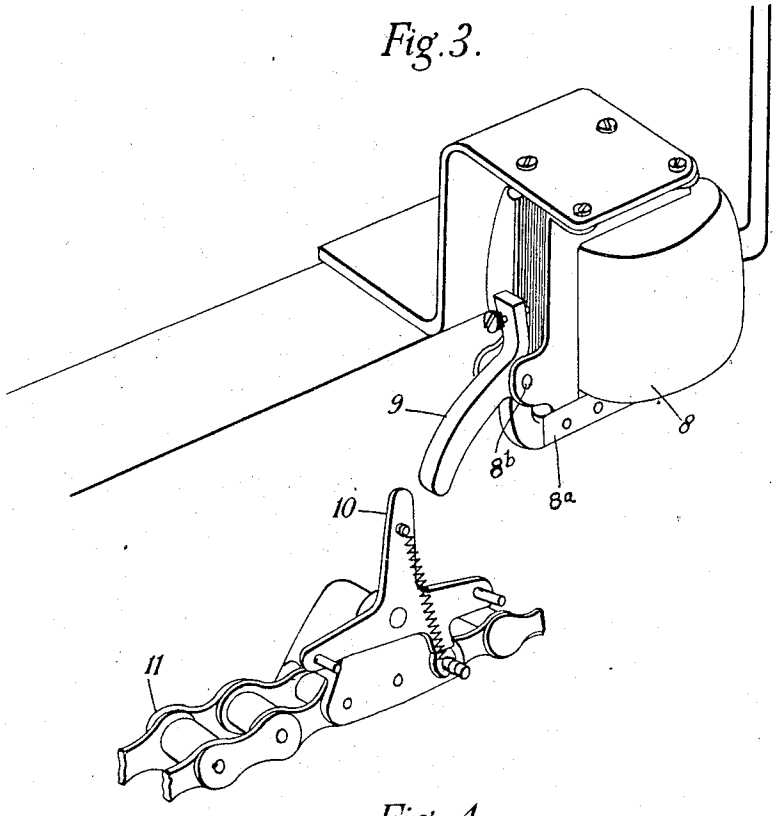
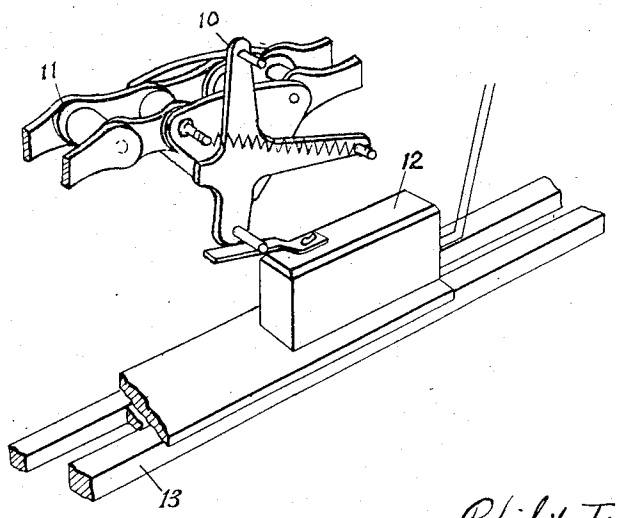


Fig. 4.



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CUTTING AND SORTING OF PAPER AND LIKE SHEETS FROM CONTINUOUS WEBS

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FIG. 3.

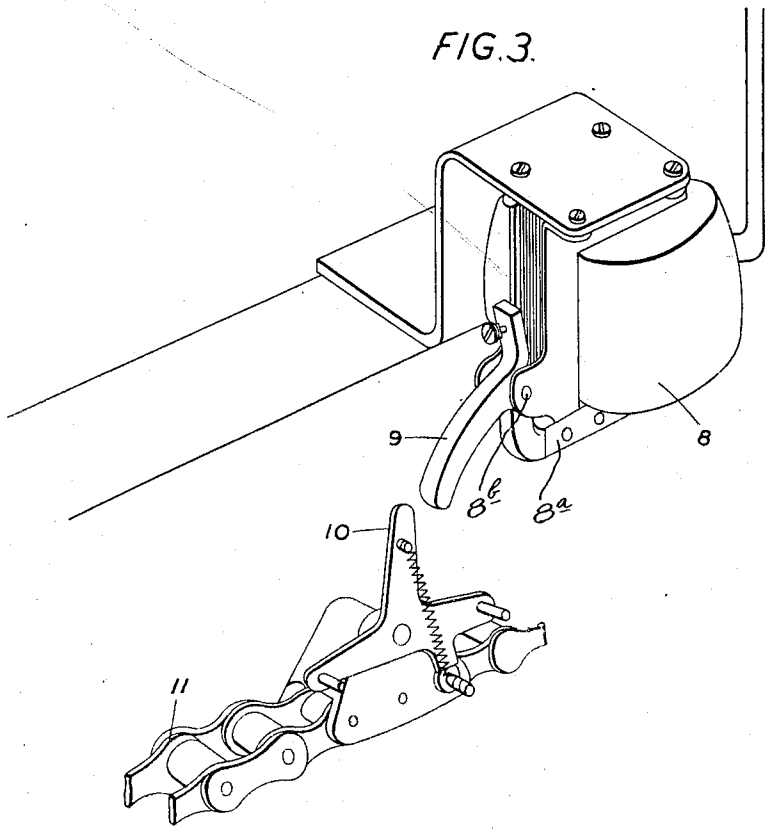
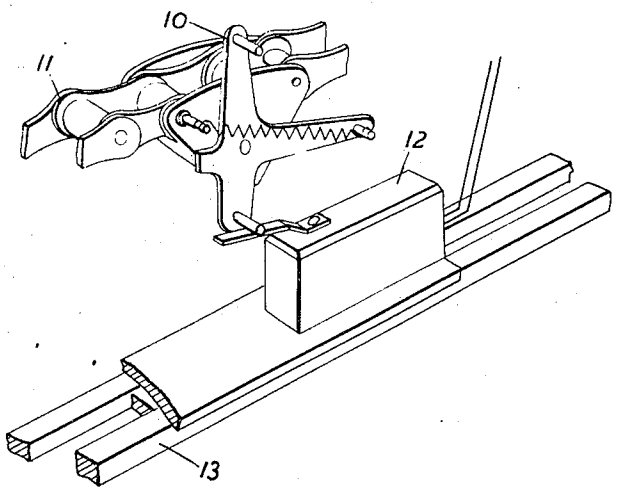


FIG. 4.



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UNITED STATES PATENT OFFICE

2,318,937

CUTTING AND SORTING OF PAPER AND LIKE SHEETS FROM CONTINUOUS WEBS

Philip Tom Goldney, Dartford, and Alfred George Hingley, Bristol, England

Application June 24, 1941, Serial No. 399,536
In Great Britain June 27, 1940

16 Claims. (Cl. 164—68)

In connection with the production of cut sheets in the paper making industry it is customary at present to take the machine web to the cutter to be cut into sheets of the required size which subsequently have to be sorted to enable defective sheets to be rejected when the remainder are counted and finally wrapped. Whilst it has been possible to conduct certain of these operations such as the slitting and the cross cutting of the web with the aid of machinery the remaining operations have had to be performed by manual labour and have in consequence tended to retard production.

The present invention has for its object to provide an improved method and means for cutting a continuous web into sheet form and for simultaneously rejecing defective sheets and if desired at the same time counting the sheets approved as sound.

According to the improved method constituting this invention the material is examined for defects while still in the web and moving towards the cutting point in a sheet cutting machine, and a sheet deflecting device is provided which by the operation of means under the control of the operative inspecting the web can be projected into the path of any one of the detached sheets with an appropriate time lag to allow for the travel of the paper from the scanning position where examination for defects occurs to the point where the deflector intervenes for the purpose of removing to a "reject" pile the sheets containing the defect. This invention therefore also consists in providing for use with a sheet cutting machine certain attachments including a movable deflector adapted when required to project into the path of the cut sheets for the purpose of directing certain selected sheets to a reject container, a scanning table over which passes the continuous web travelling towards the cutter, indicating means adapted to denote the position relatively to the web severing cuts to be made of any defect observed in the web and a hand operated control device which when manipulated will cause the deflector to be actuated with a time lag appropriate to the travel of the paper from the scanning device to the deflector. In cases where the machine is furnished with a mechanical counting device for counting the sheets delivered by the cutting machine means may be provided for subtracting one from the counter reading on each occasion a defective sheet is diverted to the reject container by the action of the deflector.

To enable the invention to be better understood reference will now be had to the accompanying drawings wherein an improved sheet cutting, sorting and counting machine is illustrated schematically by way of example.

In these drawings—

Figures 1 and 1a show in perspective that part of the machine embodying the supply roll and the scanning table.

Figures 2 and 2a show in perspective that part of the machine wherein the web is cut into sheets and the sorting and counting of the sheets occurs.

Figures 3 and 4 are perspective views of details embodied in the machine.

Referring now to the machine shown generally in Figures 1 and 2 it will be seen that a continuous web of paper *a* unwound from a supply roll **1** by the action of suitable draw rolls, one of which appears at *b*, is at regular intervals cut across into sheets by a rotating transverse cutting knife **31**, and the severed sheets so formed are conveyed by endless tapes **27** to a platform or table **25** which may be lowered automatically as the height of the pile of sheets progresses. Now in order to provide for the sorting of the sheets in accordance with this invention, there is furnished adjacent the delivery end of the machine a supplementary platform or table **24** adapted to receive rejected or faulty sheets and a movable deflector device **22** is furnished which when projected into the path of a sheet coming from the tapes **27** will divert it to a further set of conveyor tapes **23** serving to convey the defective sheet to the reject platform or table **24**. Under normal circumstances this deflector device remains inoperative and the cut sheets pass directly to the pile on the platform **25**, but it can be brought into the path of any selected sheet for the purpose of diverting the latter to the "reject" pile on the platform **24** by the manipulation of a device under the control of the operative scanning the web for defects.

On the supply side of the machine (see Figure 1) where the continuous web *a* from the supply reel **1** is led over and under guide rolls **2**, **3** and **4** on its way towards the cutting knife **31**, there is provided a scanning table *c* for the purpose of facilitating the detection of defects. This scanning table may conveniently consist of a sheet of frosted or opalescent glass illuminated from beneath as by a number of electric lamps *d* so that it will cause defects occurring in the paper web *a* passing over the table *c* to be thrown into greater prominence. This scanning table should have a width at least as great as that of the web to be cut and a length which is preferably not less than that of the largest sheet to be cut.

Now since the paper web *a* passing over the scanning table gives no indication of the points where severance will occur means must be provided to denote to the operator examining the web the proper instant for operating the control device for bringing the sheet deflector **22** into position for rejecting a sheet. With this end in view therefore one or more moving markers coacting with a stationary marker are provided for indicating artificially the points where severance

of the web will occur and consequently the particular sheet in which any defect observed will exist when cutting has been effected. The stationary marker may consist of a wire 5 held taut transversely over the web or a dark line made across the scanning table might suffice while the moving marker or markers may consist of taut wires, such as 6, extending transversely of the underside of the web said wires being carried between two endless chains 7, 7A operating in unison and at such a speed as to ensure that each occasion the movable and stationary markers come into alignment there will exist between said markers and the cutting knife 31 a length of the web material which is a multiple of the length of the unit sheets being cut. To assist adjustments of the machine being made to suit the cutting of larger or smaller sheets there may be provided intermediate the scanning table and the cutting knives a movable roll such as the guide roll 4 about which the web is passed in a loop or bight the length of which can be varied to adapt the machine to any size of sheet to be cut. Similarly means may be provided for varying the speed of travel of the movable markers in adapting the machine to cut longer or shorter sheets.

Assuming as in the case under consideration the stationary marker 5 is situated intermediate the ends of the scanning table and that when the moving and stationary markers come into alignment they denote a line on which severance of the web will occur it follows that at the instant when the markers align the operator examining the web for defects will then be observing the trailing portion of one sheet to be and the leading portion of the following sheet to be. Furthermore since it is at or about the moment when the markers align that the operator actuates, if necessary, the control means bringing the rejector into action with an appropriate time lag, there are provided two such control elements, one or the other or both of which may be actuated according to whether a defect is observed before or behind or defects are observed simultaneously both before and behind the line of the markers. Any suitable means may be employed for controlling the mechanism. Such control may be in the nature of electric press buttons A and B shown in Figure 1.

In the constructional arrangement herein illustrated, the control means comprises a number of trip levers 10 mounted at regular intervals upon an endless traveller such as the endless chain 11, the spacing of these and the rate of travel of the chain being such that the trip levers pass a given point with the same frequency as that at which the sheets are cut. The trip levers 10 in the course of their travel pass two displaceable abutments which are normally clear of the path of said levers. These abutments are spaced apart by the same amount as two adjacent trip levers on the chain and each is directly or indirectly actuated by one of the two press buttons A and B or other suitable control elements. Thus where electric press buttons are used as initial control elements they may cause a current to flow in one or another of two solenoids 8, 8¹. This will bring about a movement of one of the corresponding abutments 9 or 9¹ by attracting the armature 8a of the magnet which is pivoted at 8b and integrally connected with the abutment as shown, throwing the abutment into the path of the approaching trip lever 10, which is thus displaced from its normal position. At a further point in the travel of the trip lever 10 corresponding to the movement of the paper web from the scanning table to the cutting knife 31, the lever passes a switch element 12 which is operated only if the passing trip lever is in the displaced condition, such switch causing in turn the energizing of a further solenoid 15 (see Figure 2) controlling the operation of the sheet rejecting device 22. The switch element 12 is preferably made adjustable with reference to guide rails 13 on which it is supported in order that a suitable timing of the mechanism in relation to the size of the sheet being cut may be arranged. After passing the active switch element 12 the trip lever approaches a re-setting abutment 14 which serves to restore it to a normal or neutral position as well as any other displaced trip levers which have acted upon the switch.

Now since it is practically essential to have the sheet rejecting device 22 accurately timed with respect to the travel of the sheets conveyed from the cutter it is convenient to provide for its operation by a cam 19 rotating in unison with the cutting knives. A cam lever 18 associated with this cam 19 is operatively connected as by the link 20 and lever 21 with the sheet rejecting element 22 but these parts are normally held in an inoperative position by a latch element 17 which can be withdrawn from the cam lever by the plunger 16 of the further solenoid 15 above mentioned thereby freeing the cam lever 18 and allowing it under spring influence to follow the contour of the cam 19 and cause the deflector 22 to be projected into the path of the cut sheets. In this connection it must be understood that the influence of the solenoid 15 upon the latch 17 is of a temporary nature only so that when the cam completes its turn and imparts its maximum "lift" to the lever the latch 17 is again restored to a position for holding said lever 18 and the sheet deflector 22 inoperative until the solenoid 15 influencing the latch 17 is again energised.

If desired the trip levers may be arranged to co-act in turn with two different switch elements such as 12 and 12¹ Figure 1, the first of which causes the further solenoid 15 to be energised and the second of which causes it to be de-energised or the trip lever may make a more or less prolonged connection with a single switch device which while closed causes the further solenoid 15 to remain energised. Any suitable mechanical or electrical resetting device may be provided for restoring the trip levers to the normal position after passing the switch or switches which they influence.

Also the movable abutments 9, 9¹ employed for displacing the trip levers 10 are arranged, despite the instantaneous actuation of the operator's press buttons A and B, to remain in an active position at least until the next passing trip lever is displaced, there being provided also suitable means to restore to a normal and neutral position such abutments immediately after the displacement of the trip levers is effected. As will be appreciated it is very convenient and also usual to furnish a sheet cutting machine with an automatic counting device such as 30 which registers the number of cut sheets delivered. Where such a device is furnished it is proposed in accordance with this invention to drive said counter from the sheet cutting mechanism through the medium of a differential gear 32 one element of which is normally held stationary by a toothed sector 28 connected with the sheet rejecting mechanism 22. The main drive to the counter is in this case responsive to all sheets coming from the cutter but

as it is desired that the counter shall register accurately the number of sound sheets delivered, the toothed sector 28 acting through a pinion 29 and ratchet drive is arranged to set the counter 30 back one every occasion the sheet rejecting mechanism 22 comes into operation. If desired the counter may be arranged to sound a bell or other signal on the delivery of a ream or any other desired number of sound sheets and automatic means may also be provided to insert into the pile simultaneously a paper slip or equivalent marker to denote the separate reams in the pile.

In operating this improved machine the paper web *a* while running over the illuminated scanning table *c* is kept under observation by the machine operative and the motion of the moving marker 6 in relation to the fixed marker is also observed so that when co-incidence of these two occurs one or other or both of the control buttons A and B may be actuated if at that instant any defect or defects should be noted in that part of the web overlying the scanning table. Thus assuming a defect is observed on that side of the markers towards the supply reel the button A would be actuated and in consequence the solenoid 8 and movable abutment will cause a displacement of the next passing trip lever. On the other hand should a defect be observed in the web on that side towards the cutter the button B would be actuated causing the solenoid 8^1 and the abutment 9^1 to act upon the previous trip lever of the series. Should defects be observed both in front and behind the marker line both buttons would be pressed together with the result that two adjacent trip levers would be displaced.

As has already been explained the motion of the conveyor 11 is regulated in relation to the speed of traverse of the web in such a way that by the time a portion of the web containing an observed defect reaches the cutter, the relative trip lever displaced by action of the operative will reach the switch element 12 and bring into performance the sheet deflecting device 22 just as the detached sheet approaches the point where the deflector is situate. This movement of the deflector not only causes the ejected sheet to be conveyed to the reject pile but at the same time the movement of the toothed sector 28 by rotating the pinion 29 and the differential gear 32 sets back by one the reading on the counting register 30.

We claim:

1. An improved apparatus for cutting a continuous web into sheet form and simultaneously separating defective sheets from sound sheets, comprising a sheet cutting machine, a deflector device adapted on being actuated to divert to a reject pile a sheet coming from the cutter, a scanning table over which the web passes before reaching the cutter point, means under the control of an operative whereby the deflector device may be rendered active after a predetermined lapse of time, said control means upon actuation causing the displacement of one of a series of elements carried upon an endless conveyor, said displaced element being arranged after traveling a suitable distance and time to transmit an impulse bringing into action the sheet deflector device, and means for restoring to the normal or neutral position the displaced elements after the required impulse transmission has occurred.

2. Apparatus for cutting a continuous web into sheet form and separating defective sheets from perfect sheets; comprising a scanning means over which the web passes, a cutting means for the web, a fixed indicator adjacent to the web and the scanning means, a movable indicator repeatedly moving in the direction of movement of the web along a predetermined fixed path past the fixed indicator, the mechanism being so constructed and arranged that upon movement of said indicators into a predetermined relation there will exist between the indicators and the cutter a length of web which is a multiple of the length of the sheets being cut, and manually controlled mechanism which upon operation when the indicators are in a predetermined relation and the web shows defects upon either side of the indicators, effects the rejection of that sheet cut from the web and having the defect therein.

3. Apparatus as set forth in claim 2 with means for varying the lengths of the sheet units.

4. Apparatus as set forth in claim 2 in which said manually controlled mechanism comprises a series of oscillatable trip members movable along a prescribed path, means for selectively throwing the trip members to an operative position, an electrically actuated defective sheet throw-off means, and a control switch for said throw-off means arranged to be closed by an operative trip member following the detection of a defect in the web sheet.

5. Apparatus for cutting a continuous web into sheet form and separating defective sheets from perfect sheets; comprising means for cutting the web into sheet units, means for carrying the sheet units away from the cutting means, means for receiving the sheet units from the carrier means, a defective sheet carry-off means leading from said carrier means, and a shiftable defective sheet diverting means adapted to be moved into a position to divert a defective sheet to the defective sheet carry-off means.

6. Apparatus for cutting a continuous web into sheet form and separating defective sheets from perfect sheets; comprising means for cutting the web into sheet units, a sheet unit receiving conveyor leading from the cutting means, a sheet unit receiver at the discharge end of the conveyor, a rocking frame at the said discharge end of the conveyor having a rotatable bar extending transversely of the conveyor and beneath which the sheet units are delivered to the receiver, said bar forming one end roller of a defective sheet carry-off conveyor, and means for rocking said frame in a direction to lower the end of the carry off conveyor to a position with respect to the first conveyor to receive a defective sheet from the first conveyor and carry the same away from the sheet receiver.

7. Apparatus for cutting a continuous web into sheet form and separating the defective sheets from perfect sheets; comprising a scanning means over which the web passes, means for cutting the web after the same passes the scanning means, a fixed marker adjacent to the web and to the central part of the scanning means, a movable marker supported for continuous repeated movement in the direction of movement of the web and through a distance substantially equaling the length of the scanning means over which the web passes, the apparatus being so constructed and arranged that upon movement of said movable indicator into a predetermined relation with the fixed indicator there will exist between the indicators and the cutter a length of web which is a multiple of the length of the sheet being cut, an electrically actuated throw-off means for defect bearing sheet units and following said cutter, an endless

belt disposed adjacent to the scanner and carrying a plurality of spaced oscillatable trip members, one run of said belt moving in the direction of movement of the web, manually controlled means adjacent the said one run of the belt for effecting the selective tripping of said trip members, an electric circuit controlling switch adjacent to the other run of said belt and controlling the operation of said throw-off means, said switch being arranged to be closed by a tripped trip member, and said switch being so disposed with respect to said manually controlled means that the time lag between actuation of the manually controlled means and the closing of the switch by the tripped member is sufficient for movement of an observed web defect from the markers pass the cutter whereby the defect will be contained in a sheet unit and ejected by the throw-out means.

8. Apparatus as set forth in claim 7 including a vertically adjustable idler roller over which the web passes between the marker and the cutter, said idler roller by vertical adjustment facilitating varying the length of the sheet units.

9. An improved apparatus for cutting a continuous web into sheet form and simultaneously separating defective sheets from the sound sheets, comprising a sheet cutting machine, a deflector device adapted on being actuated to divert to a reject pile a sheet coming from the cutter, a scanning table over which the web passes before reaching the cutter point, means under the control of an operative whereby the deflector device may be rendered active after a predetermined lapse of time, and said scanning table being translucent and furnished with illuminating means adapted to throw into greater prominence any defects appearing in that part of the web overlying the scanning table.

10. An improved apparatus for cutting a continuous web into sheet form and simultaneously separating defective sheets from the sound sheets, comprising a sheet cutting machine, a deflector device adapted on being actuated to divert to a reject pile a sheet coming from the cutter, a scanning table over which the web passes before reaching the cutter point, means under the control of an operative whereby the deflector device may be rendered active after a predetermined lapse of time, and means to indicate the times appropriate for actuating the control means bringing the deflector into an active condition.

11. An improved apparatus for cutting a continuous web into sheet form and simultaneously separating defective sheets from the sound sheets, comprising a sheet cutting machine, a deflector device adapted on being actuated to divert to a reject pile a sheet coming from the cutter, a scanning table over which the web passes before reaching the cutter point, means under the control of an operative whereby the deflector device may be rendered active after a predetermined lapse of time, and fixed and moving marker devices, arranged for use in conjunction with the scanning table, which by coinciding at intervals denote the proper instant for the actuation of the control means.

12. An improved apparatus for cutting a continuous web into sheet form and simultaneously separating defective sheets from the sound sheets, comprising a sheet cutting machine, a deflector device adapted on being actuated to divert to a reject pile a sheet coming from the cutter, a scanning table over which the web passes before reaching the cutter point, means under the control of an operative whereby the deflector device may be rendered active after a predetermined lapse of time, an endless conveyor, and a series of displaceable elements carried by the conveyor, actuation of the control means causing displacement of one of said elements, the said displaced element being adapted after traveling a suitable distance and time to transmit an impulse bringing into action the sheet deflector device.

13. An improved apparatus for cutting a continuous web into sheet form and simultaneously separating defective sheets from the sound sheets, comprising a sheet cutting machine, a deflector device adapted on being actuated to divert to a reject pile a sheet coming from the cutter, a scanning table over which the web passes before reaching the cutter point, means under the control of an operative whereby the deflector device may be rendered active after a predetermined lapse of time, and two separate control devices for the apparatus as and for the purpose herein described.

14. An improved apparatus for cutting a continuous web into sheet form and simultaneously separating defective sheets from the sound sheets, comprising a sheet cutting machine, a deflector device adapted on being actuated to divert to a reject pile a sheet coming from the cutter, a scanning table over which the web passes before reaching the cutter point, means under the control of an operative whereby the deflector device may be rendered active after a predetermined lapse of time, a member sensitive to impulses derived from the control means, and the said sheet deflector device being normally retained in an inoperative condition by said member.

15. An improved apparatus for cutting a continuous web into sheet form and simultaneously separating defective sheets from the sound sheets, comprising a sheet cutting machine, a deflector device adapted on being actuated to divert to a reject pile a sheet coming from the cutter, a scanning table over which the web passes before reaching the cutter point, means under the control of an operative whereby the deflector device may be rendered active after a predetermined lapse of time, and an intermittently acting drive mechanism timed in synchronism with the cutter for bringing the sheet deflector into an operative condition.

16. An improved apparatus for cutting a continuous web into sheet form and simultaneously separating defective sheets from the sound sheets, comprising a sheet cutting machine, a deflector device adapted on being actuated to divert to a reject pile a sheet coming from the cutter, a scanning table over which the web passes before reaching the cutter point, means under the control of an operative whereby the deflector device may be rendered active after a predetermined lapse of time, and a counting register driven from the sheet cutting mechanism and provided with means for correcting the reading of the counter on occasions when defective sheets are delivered.

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