

July 27, 1937.

R. REINARTZ

2,087,997

SHEET FEEDING MECHANISM

Filed Dec. 19, 1935

2 Sheets-Sheet 1

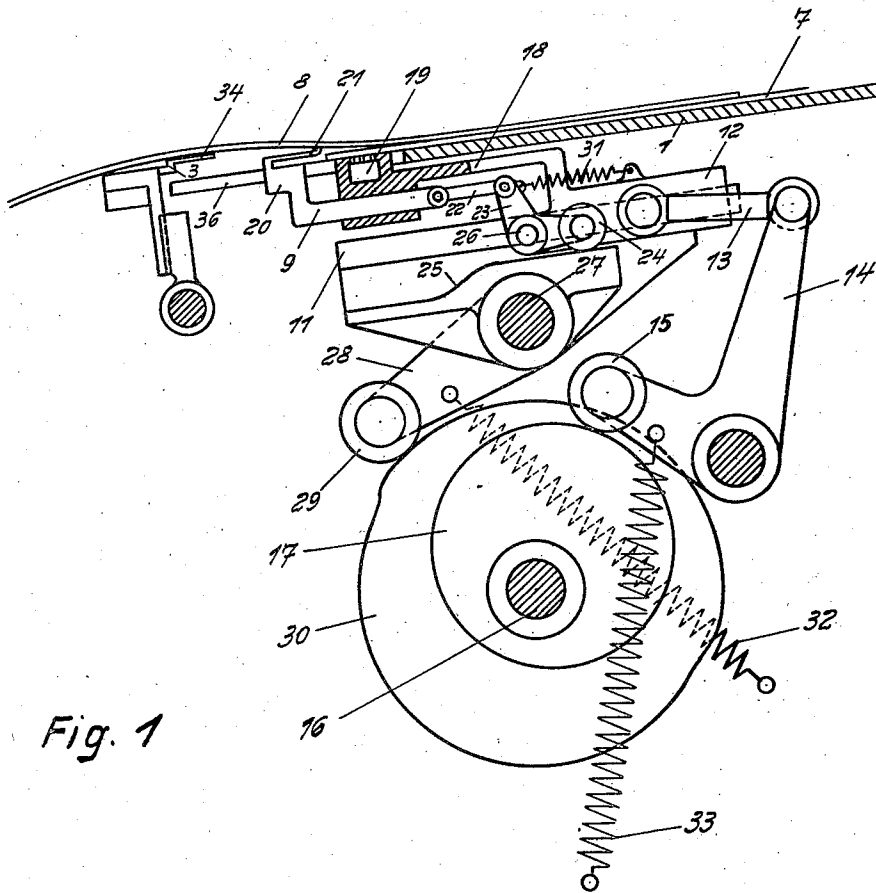


Fig. 1

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2 Sheets-Sheet 2

Fig. 2

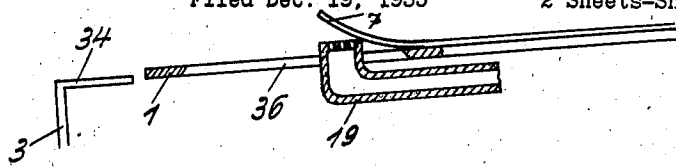


Fig. 3

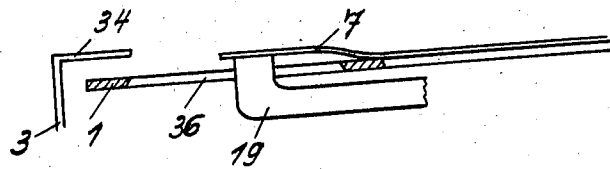


Fig. 4

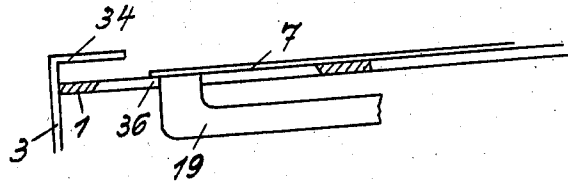


Fig. 5

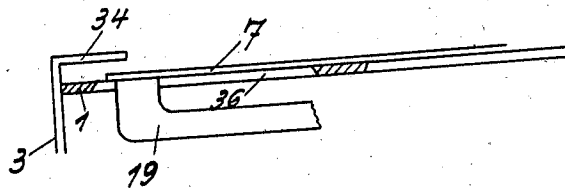
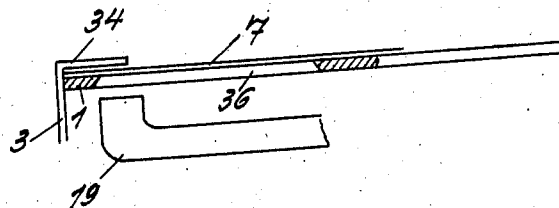


Fig. 6



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UNITED STATES PATENT OFFICE

2,087,997

SHEET FEEDING MECHANISM

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Application December 19, 1935, Serial No. 55,221
In Germany December 29, 1934

20 Claims. (Cl. 271—53)

This invention relates to sheet feeding mechanism, and it more specifically pertains to means whereby sheets, conveyed either individually or in superimposed relation, are advanced to front registering guides.

In mechanism of the class to which my invention applies, the sheet aligning means and/or the final front registering guides have been equipped with cover plates or the like for the purpose of holding down the leading edge of sheets to be registered, to thereby prevent buckling or curving up of the sheets.

It has been found, however, that with the arrangements heretofore used the sheets frequently do not enter below the cover plates and consequently they fail to reach the registering guides.

One of the primary objects of my invention therefore is to provide means which will effectively hold down the leading edge of sheets to be registered and advance them under positive control to the registering guides.

Another object of my invention resides in the provision of pneumatic means whereby the principle of my invention can be accomplished.

A further object is to provide a novel combination of sheet controlling means which includes sheet aligning devices adapted to effectively slow down oncoming sheets prior to reaching their registering position.

Other objects of my invention will be apparent from the appended claims and accompanying drawings, which latter illustrate some desirable embodiments of the invention, and in which drawings:

Figure 1 is a side elevation, partly in cross section, of a registering mechanism to which my invention has been applied, while

Figures 2 to 6 represent in diagrammatic views the various steps of one manner whereby my invention may be carried into effect.

Referring now to the embodiment of my invention illustrated in Figure 1, the sheets to be registered are fed in superimposed relation over the feed table 1 and toward the registering guides 3. The sheet 7 is shown in its position ready to be advanced to the aligning i. e. slow down member 9, 20, whereas the previously registered sheet 8 has left the front guides 3 and is in the course of being removed from the table 1, its rear portion still in part covering the underlying sheet 7.

The mechanism whereby the various functions of my invention are accomplished includes a guide member 11 which accommodates a slide 12 so that the latter can be moved to and fro by means of a connecting rod 13, one end of which is piv-

oted to said slide, while the other end is pivoted to one arm of a bell crank lever 14.

On the end of the other arm of said lever 14 is mounted a roller 15 which is held against a cam 17 secured to a shaft 16. The slide 12 is provided with an arm 18, the front end of which is formed with a suction nozzle 19. A bore in the arm 18 serves to receive and guide an extension of the member 9 so that said arm may freely slide parallel to the suction surface of the nozzle 19. The hook 20 which is provided with a cover plate 21 to extend over the leading edge of oncoming sheets, is moved relatively to the nozzle 19 by means of a connecting rod 22 pivoted to the free end of the arm 9, bell crank lever 23, roller 24 and cam 25, said bell crank lever 23 being pivotally mounted at 26 to the slide 12.

Consequently, during the reciprocating movement of said slide, the roller 24 will ride over the cam 25, thereby reciprocating the hook 20 with relation to the nozzle 19. The guide member 11 and the cam 25 are mounted on a shaft 27 which is rocked by means of an arm 28, the free end of which carries a roller 29 which is held against a cam 30 secured to the shaft 16. The cam rollers 24, 15 and 29 are preferably held against their cooperating cams by means of tension springs 31, 33 and 32 respectively.

The operation of the mechanism just described is as follows. The suction nozzle 19 together with the hook 20 are preferably guided by or moved within grooves 36 or the like which may be provided in the table 1, one reciprocation of the nozzle 19 and the hook 20 occurring during each cycle of revolution of the shaft 16. As indicated above, the hook 20 has a relative movement to the nozzle 19 in addition to its regular reciprocating motion.

In the position illustrated in Figure 1, the projecting end of the cover plate 21 on the hook 20 is located somewhat in front and above the leading edge of the oncoming sheet 7, which is shown as being engaged by the nozzle 19. Therefore, upon further relative movement of said hook 20 and the nozzle 19 towards each other the leading edge of sheet 7 will become located beneath the cover plate 21.

It is desirable that when the nozzle 19 is about to engage the leading edge of the oncoming sheet 7, the speed at which said nozzle is moved forward should be equal to the speed of the oncoming sheet, which latter may be advanced to the position shown in Figure 1 by any conventional means such as forwarding tapes or the like. This

will avoid any deviation of an oncoming sheet from its normal path of travel.

After the nozzle 19 has engaged the sheet 7 the slide 12 will continue its forward movement and subsequently the roller 24 will reach the depressed portion of the cam 25, thereby the lever 23 will be rocked in a clockwise direction and the hook 20, together with the cover plate 21 will be moved towards the nozzle 15 so that the leading edge of the sheet 7 will enter beneath said cover plate. The motion of the slide 12 will be decelerated so that after the nozzle 19 has released the sheet 7, the speed of the slide 12 and therewith of hook 20 will be such that the leading edge of the sheet will abut gently against the inner vertical face of the hook 20. The degree of deceleration depends on the contour of the cam 17. In this manner the hook 20 may readily serve as a preregistering or as an aligning member for the sheets.

The forward movement and deceleration of the slide 12 continues after the hook or hooks 20 have received the sheet, and at the time when the leading edge of a sheet approaches the front guides 3 the sheet will have assumed a minimum speed. As soon as the sheet enters beneath the cover plate 34, the guides 3 begin to move down from the position shown in Figure 1 to an extent that a clearance will remain between the top surface of the sheet and said cover plate, permitting the leading edge of the sheet to lay free on the registering table.

As illustrated in Figure 1, during the time that the underlying sheet 7 is being registered as described above, the previously registered sheet 8, which overlays the sheet 7 is being removed to the paper handling machine such as a printing press. While a portion of sheet 8 may still in part overlap the sheet 7, during the registering of the latter, it will not interfere with its register, because the cover plate 21 of the hook 20 holds the sheet 8 above the leading edge of sheet 7.

While the sheet 7 is being held against the guides 3, the slide 12 is given a further accelerated forward movement to an extent that the rear edge of the cover plate 21 will pass the leading edge of the sheet 7. Thereupon the guide 11 is rocked by the cam 30 in a counter-clockwise direction so that the nozzle 19 and the hook 20 will become located below the top surface of the table 1. The slide 12 is then moved back and before the hook 20 reaches its sheet receiving position the slide 11 is again rocked upwardly when the roller 29 engages the cusp of the cam 30. Simultaneously, as the roller 24 rides over the high portion of cam 25, the hook 20 is moved away from the nozzle 19 and the parts will then have resumed their initial position shown in Figure 1, ready to receive the next sheet.

The hooks 20 may be omitted, in which case the sheets would be advanced to the registering guides by the suction nozzle 19, or the registering guides may be omitted and the hooks 20 may serve as the only means for registering the sheets.

Furthermore, as illustrated in Figures 2 to 6, the mechanism for operating the suction nozzle 19 could be such that said nozzle, prior to engaging an oncoming sheet, would be raised so that its sheet engaging surface would be above the plane of the sheet support, thereby deflecting the leading edge of a sheet. After engaging the sheet said nozzle would again be lowered in order to bring the sheet into the plane of said support.

In the arrangement represented by said figures, the sheet slow down i. e. sheet preregistering hook 20 is omitted and the sheets are advanced direct to the front guides 3 by the nozzle 19. The mechanism whereby the nozzle 19 is actuated may of course be similar to that illustrated in Figure 1.

Referring to Figure 2, the guide 3 is shown in front of the registering table 1 and below its surface in order to avoid any interference with the forwarding of the preceding sheet. The leading edge of the sheet 7 to be registered is sometimes curved upwards from its own nature or if not so is deflected by the upward movement of the nozzle 19 and after suction is applied to said nozzle it is dipped down into the plane of nozzle 19 (see Figure 3). At the moment when the nozzle 19 engages the sheet 7, its forward speed should be equivalent to that at which the sheet is being advanced to said nozzle.

During the continued forward movement of the nozzle 19 with the sheet 7, they are lowered into the plane of table 1 (see Figure 4) and the front guides 3 are moved up and toward the front edge of the table 1 into the position shown in Figure 4, so that the cover plate 34 of said guides will extend over said front edge when the nozzle and sheet will have advanced so far as shown in Figure 5. Shortly after the leading edge of the sheet 7 has passed beneath the cover plate 34, the suction in the nozzle 19 is broken, thereby releasing the sheet which may thereupon be brought and held in contact with the guides 3 by means of forwarding tapes or any other suitable mechanism (see Figure 6). The guides 3, together with the cover plate 34, before the sheet touches said guides have been moved downward into the position illustrated in Figure 6 so that said cover plate will hold down the leading edge of sheet 7 but leaving a clearance between the sheet and the cover plate 34. The nozzle is then returned to its sheet engaging position shown in Figure 2.

It will be readily understood that any desirable number of front guides, aligning devices and nozzles 19 may be used, and the guides, aligning devices and nozzles may be arranged either in line parallel with the feeding direction of the sheets, or they may be spaced laterally in offset relation to each other.

Furthermore, the cover plate 34 need not be an integral part of the guide 3 but could be a separate member actuated independently of said guides. In that event the guides 3 would merely move up and down, whereas the cover plate 34 would have imparted thereto a movement similar to that hereinabove described. In addition to the cover plate 34 or 21, other means for holding down and controlling the sheets could be provided.

The described devices may be made use of if the cover plate is bent upwards at its rear end or if the cover plate of the aligning device is movable up and down similarly to the motion of guides 3 described because such bending or motion of the cover plates sometimes is not sufficient to securely bring the sheet under the cover plate especially with stiff and wavy material. The motion of the cover plates needs not to be so that they remain parallel with the feeding table, but they may be oscillated around an axle parallel to this table fixed in the supports of the cover plate as has been described in my Patent No. 2,011,776.

The devices may be applied both if the registering operation is effected whilst the sheet to

be registered is covered by a part of the preceding sheet and if the preceding sheet has left the feeding table in advance. Either seriated sheets or single sheets may be advanced over the feeding table.

It will be readily understood that while I have described some preferred forms of my invention, various other modifications are possible without departing from the principle of the invention, furthermore, my invention may be successfully embodied in other types of sheet registering apparatus, therefore, it is my intention to cover any arrangements that will come within the scope of the appended claims.

I claim:

1. Sheet registering mechanism, having in combination stock supporting means, movable sheet aligning means, and suction means having relative movement with respect to said aligning means, said suction means being adapted to engage the bottom surface of an oncoming sheet, advance it to said aligning means and release it prior to touching the registering face of said aligning means.

2. Sheet registering mechanism, having in combination stock supporting means adapted to receive a continuous bank of seriated sheets, sheet aligning means, and suction means having relative movement with respect to said aligning means, said suction means being adapted to engage the bottom surface of an underlying sheet, advance said sheet to said aligning means and release it prior to being registered.

3. Sheet registering mechanism, having in combination stock supporting means adapted to receive a continuous bank of seriated sheets, sheet aligning means, and suction means having relative movement with respect to said aligning means, said suction means being adapted to engage the bottom surface at the leading edge of an underlying sheet, advance said sheet to said aligning means and release it prior to being registered.

4. Sheet registering mechanism, having in combination stock supporting means adapted to receive a continuous bank of seriated sheets, sheet aligning means, and suction means having relative movement with respect to said aligning means, said suction means being adapted to engage the bottom surface at the leading edge of an underlying sheet, advance said sheet to said aligning means and release it prior to its leading edge abutting against said aligning means.

5. Sheet registering mechanism, having in combination stock supporting means, movable sheet aligning means, and suction means having relative movement with respect to said aligning means, said suction means being adapted to engage the bottom surface of an oncoming sheet, raise said sheet above its support and then lower it to present it to said aligning means while lying flat on said support.

6. Sheet registering mechanism, having in combination stock supporting means adapted to receive a continuous bank of seriated sheets, movable sheet aligning means, and suction means having relative movement with respect to said aligning means, said suction means being adapted to engage the bottom surface of an underlying sheet, raise said sheet above its support and then lower it to present it to said aligning means while lying flat on said support.

7. Sheet registering mechanism, having in combination, a registering table adapted to support a continuous bank of seriated sheets, front

registering guides, sheet slow down means adapted to present the leading edge of a sheet to said guides, and suction means adapted to engage the leading edge of an oncoming underlying sheet and advance it to said sheet slow down means.

8. Sheet registering mechanism, having in combination, a registering table adapted to support a continuous bank of seriated sheets, movable front registering guides having a portion thereof extending over the leading edge of a sheet to be registered, sheet slow down means adapted to present the leading edge of a sheet to said guides, and suction means adapted to engage the leading edge of an oncoming underlying sheet and advance said sheet into engagement with said sheet slow down means.

9. Sheet registering mechanism having in combination, a registering table, front registering guides, preregistering means having a portion thereof extending over the leading edge of an oncoming sheet to hold it down, and suction means adapted to engage the bottom surface at the leading edge of an oncoming sheet and advance it to said preregistering means.

10. Sheet registering mechanism, having in combination, a registering table adapted to support a continuous bank of seriated sheets, front registering guides, preregistering means having a portion thereof extending over the leading edge of a sheet to be registered in order to avoid curling up of said leading edge, said preregistering means being adapted to slow down sheets during their travel to said front registering guides and having means to raise a previously registered sheet above an oncoming sheet, and suction means adapted to engage the leading edge of an oncoming sheet and present it to said preregistering means.

11. Sheet registering mechanism, having in combination, a registering table, front registering guides, preregistering means adapted to engage an oncoming sheet, slow it down, and move bodily with a sheet to present it to said front registering guides, and suction means adapted to engage the bottom surface at the leading edge of an oncoming sheet and present it to said preregistering means.

12. Sheet registering mechanism, having in combination, a registering table, front registering guides, sheet slow down means adapted to present the leading edge of a sheet to said guides, and suction means arranged to engage the underside of the leading edge of an oncoming sheet and move bodily with a sheet to present it to said slow down means.

13. Sheet registering mechanism, having in combination, a registering table adapted to support a continuous bank of seriated sheets, front registering guides, sheet slow down means adapted to present the leading edge of a sheet to said guides and having an integral portion extending over the leading edge of a sheet to be registered, and suction means adapted to engage the bottom surface of an oncoming underlying sheet and move bodily with it to present it to said slow down means.

14. Sheet registering mechanism, having in combination, a registering table adapted to support a continuous bank of seriated sheets, front registering guides, sheet slow down means adapted to present the leading edge of a sheet to said guides, suction means adapted to engage the underside of the leading edge of an oncoming underlying sheet and advance a sheet into engagement with said sheet slow down means, and

an integral portion on said slow down means extending over the leading edge of a sheet to be registered and holding a previously registered sheet out of the path of said suction means.

5 15. Sheet registering mechanism, having in combination stock supporting means, sheet aligning means, covering means adjacent to said sheet aligning means, and suction means having relative movement with respect to said covering
10 means, said suction means being adapted to engage the bottom surface of an oncoming sheet, advance it under the rear edge of said covering means and release it prior to its leading edge abutting against said aligning means.

15 16. Sheet registering mechanism, having in combination stock supporting means, movable sheet aligning means, covering means adjacent to said sheet aligning means, and suction means having relative movement with respect to said
20 covering means, said suction means being adapted to engage the bottom surface of an oncoming sheet, advance it under the rear edge of said covering means and release it prior to its leading edge abutting against said aligning means.

25 17. Sheet registering mechanism, having in combination stock supporting means, sheet aligning means, and suction means having relative movement with respect to said aligning means, said suction means being adapted to raise and
30 thereby engage the bottom surface of an oncoming sheet, and then lower it to present it to said aligning means while lying flat on said support.

18. Sheet registering mechanism, having in

combination stock supporting means adapted to receive a continuous bank of seriated sheets, sheet aligning means, and suction means having relative movement with respect to said aligning means, said suction means being adapted to raise
5 and thereby engage the bottom surface of an underlying sheet, and then lower it to present it to said aligning means while lying flat on said support.

10 19. Sheet registering mechanism, having in combination stock supporting means, movable sheet aligning means, and suction means having relative movement with respect to said aligning means, said suction means being adapted to engage the bottom surface of an oncoming sheet,
15 raise said sheet above its support, then lower it to present it to said aligning means while lying flat on said support and release it prior to the leading edge of said sheet touching the registering face of said aligning means.

20 20. Sheet registering mechanism, having in combination stock supporting means, sheet aligning means, and suction means having relative movement with respect to said aligning means, said suction means being adapted to raise and
25 thereby engage the bottom surface of an oncoming sheet, then lower it to present it to said aligning means while lying flat on said support and release it prior to the leading edge of said sheet touching the registering face of said aligning means.
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