

March 9, 1943.

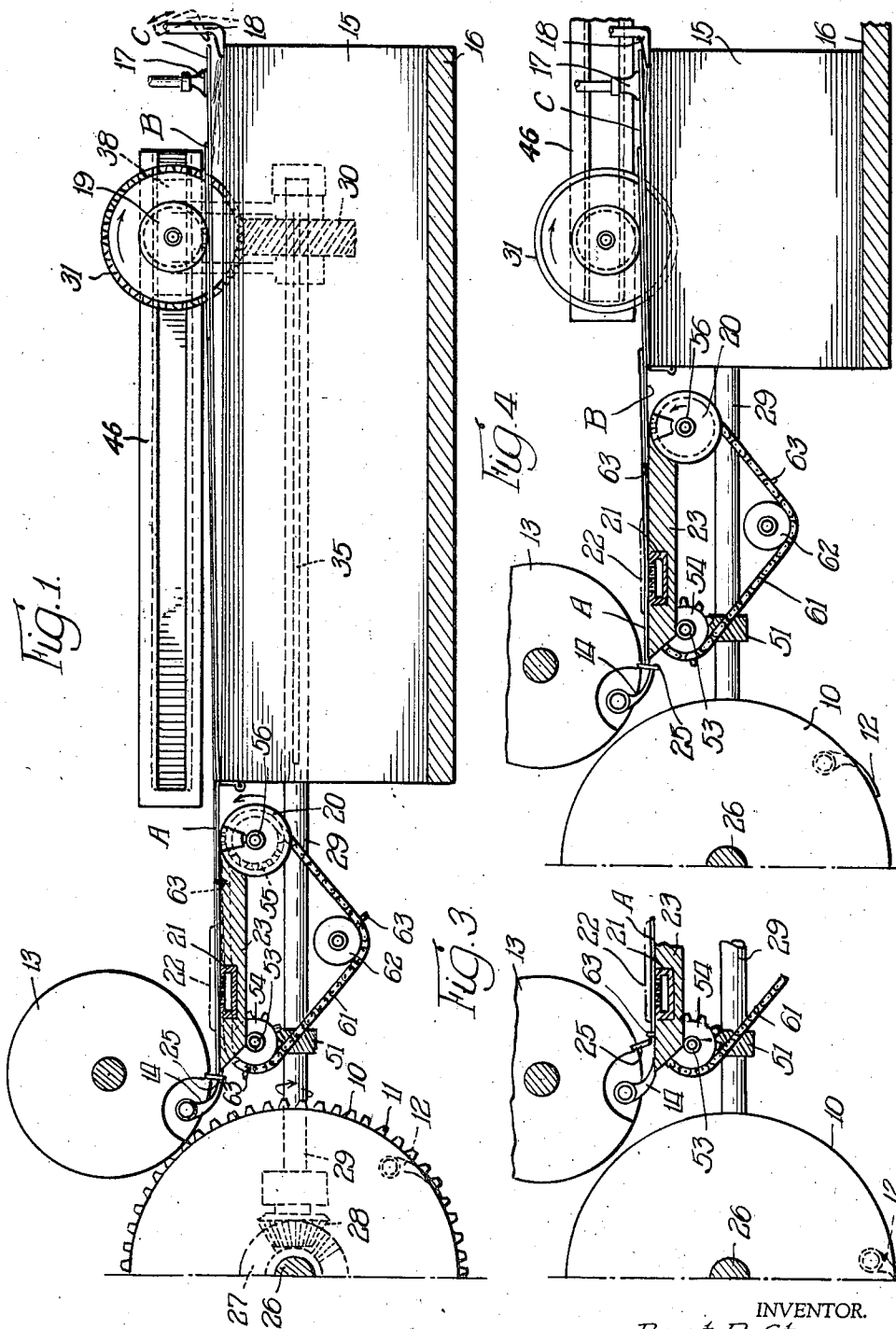
B. D. STEVENS

2,313,100

SHEET FEEDING MECHANISM

Filed Aug. 26, 1940

3 Sheets-Sheet 1



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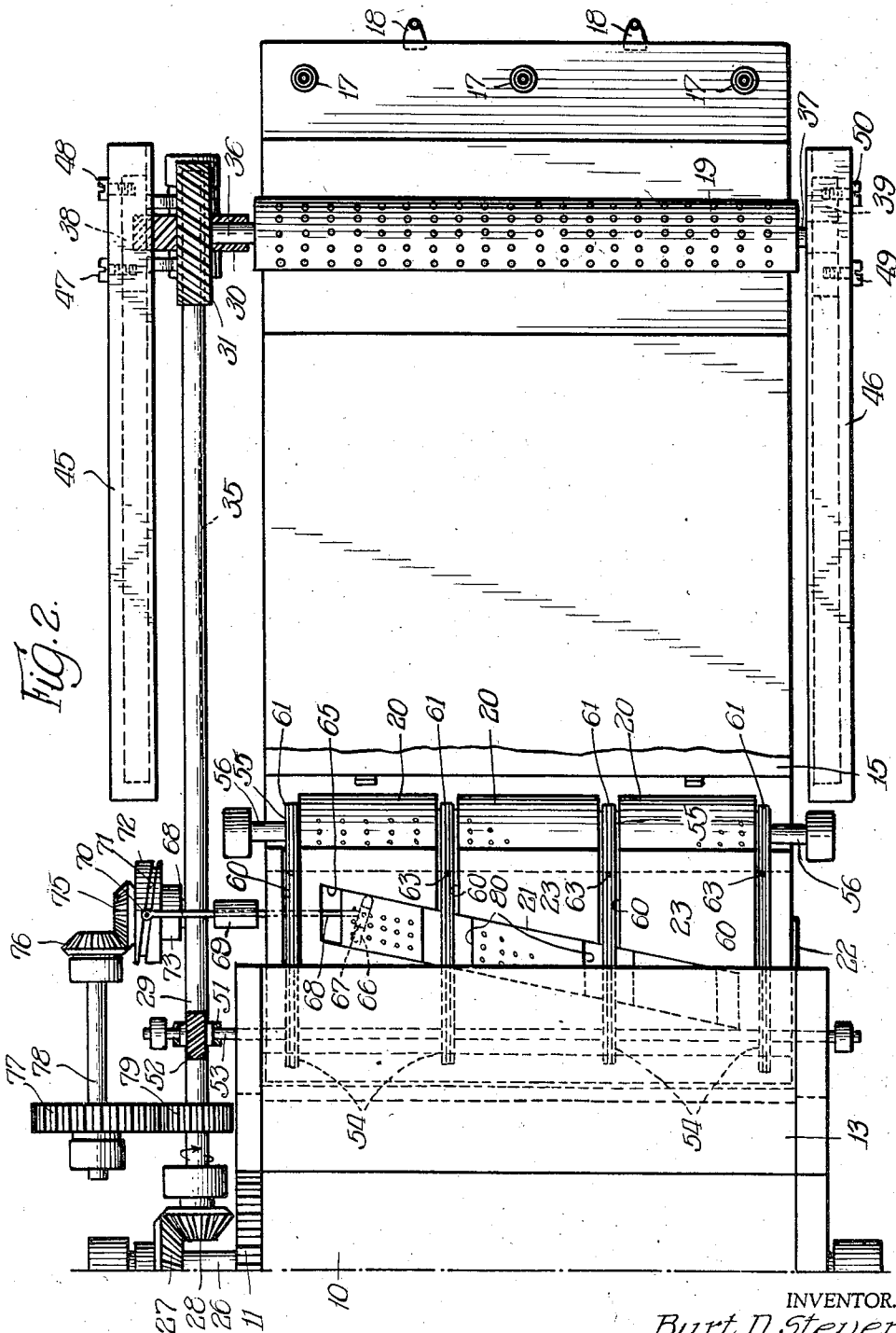
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SHEET FEEDING MECHANISM

Filed Aug. 26, 1940

3 Sheets-Sheet 2



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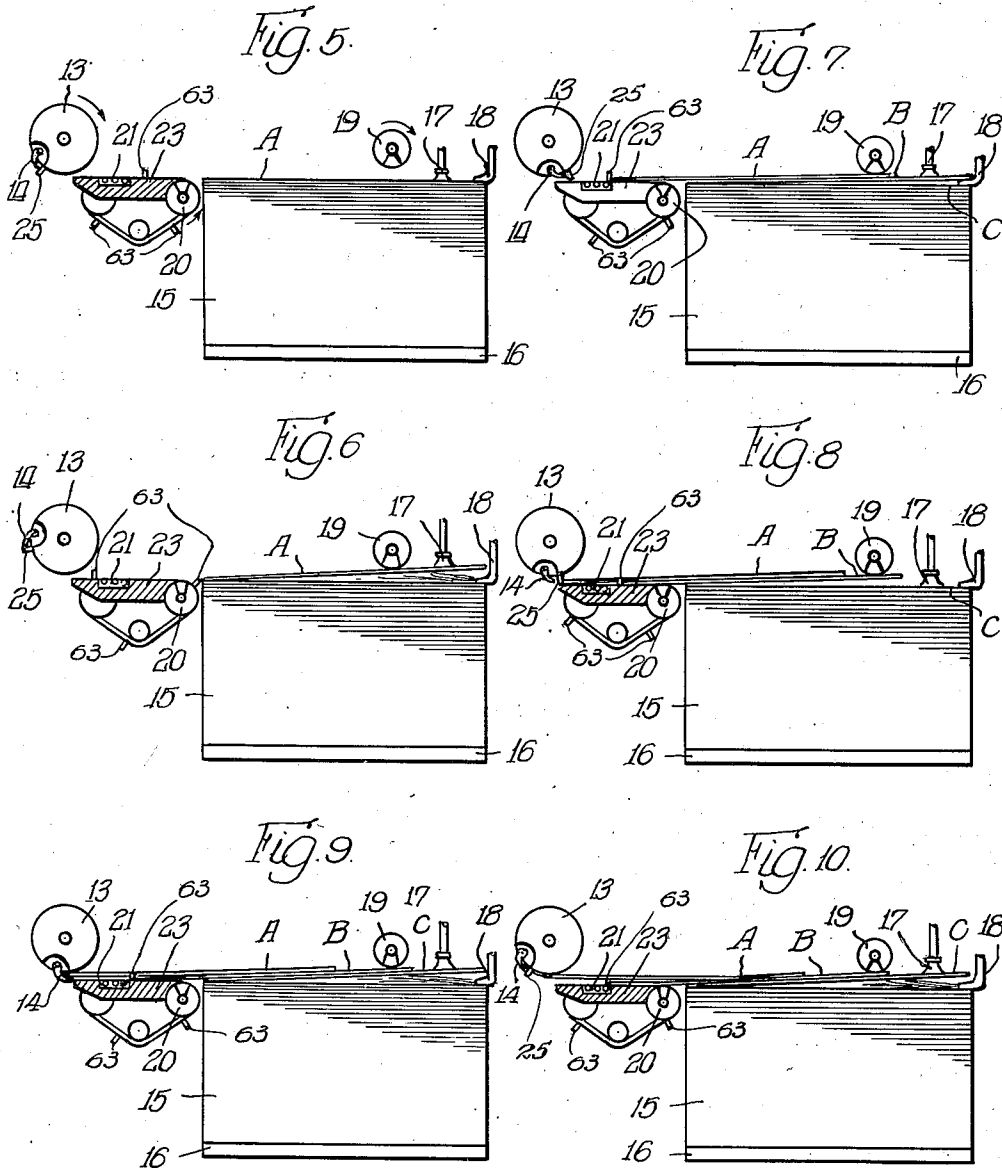
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SHEET FEEDING MECHANISM

Filed Aug. 26, 1940

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,313,100

SHEET FEEDING MECHANISM

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pany, Chicago, Ill., a corporation of Illinois

Application August 26, 1940, Serial No. 354,159

49 Claims. (Cl. 271-26)

This invention relates to sheet feeders in general and more specifically to that class of feeders in which sheets are separated from a pile and then forwarded and registered while at least two sheets are in partly lapped relation to one another.

The invention is intended more particularly for use in connection with sheet handling machinery such as high speed cylinder printing presses where rapid feeding of sheets in perfect register is required.

Heretofore, in feeder mechanisms where sheets are being fed one by one to a printing press, it has been customary to completely remove a sheet from the pile before front and side registration of the sheet could commence. Consequently, it was essential to place the feeder pile at such a distance from the sheet receiving end of the press that ample space would be provided to accommodate at least one entire sheet on the registering table and to permit of complete registration and partial removal of the sheet before the next oncoming sheet could reach it. In other words, the distance between the leading edges of successive sheets would equal not less than the length of the maximum size sheet that the press could handle. The floor space required for the press was therefore correspondingly increased. Furthermore, because of the fact that the sheets, in order to attain a maximum output of the press, had to travel that distance within a limited period of time, the velocity of the sheets at the moment when they reach the point to be acted upon by the registering means, was high and the sheets were difficult to control, thereby rendering registration of the sheets unreliable.

It is one of the foremost objects of my invention to overcome disadvantages such as I have pointed out above and to provide a sheet feeder which permits of placing the feeder pile within a distance from a sheet handling machine appreciably less than the length of the maximum size sheet, in fact not more than substantially the length of the minimum size sheet that can be handled by such machine.

Another object is the provision of mechanism whereby the sheets shall be advanced to the registering guides at a minimum rate of speed over a minimum distance in partially lapped relation.

A further object is to make possible a positive alignment of each sheet before it reaches the registering means and to reduce the number of sheets in transit to a minimum.

A still further object of my invention is to pro-

vide means whereby a separated sheet as it is being advanced toward the registering guides, will be tautened so as to provide a support for a preceding sheet and urge it forward while the latter sheet is being registered.

Another aim of the invention is the provision of improved means whereby the separated sheets are forwarded in substantially the same plane as the top of the pile.

Another feature characteristic of my invention is a registering table of minimum length which shall serve to support merely the front portions of a sheet during its registration, while the rear portion of the sheet is being supported by the tautened succeeding sheet.

Other objects and novel features of construction and operation of the present invention will be readily apparent from the following description, appended claims and accompanying drawings of which:

Figure 1 is a front elevation, partly in section, of a preferred embodiment of the novel feeder and applied in connection with what is termed in the art a stop gripper transfer mechanism;

Figure 2 is a plan view of the parts shown assembled in Figure 1;

Figure 3 represents a sectional view of the left hand portion viewed in Figure 1, but showing the respective parts in a different position;

Figure 4 is an illustration similar to Figure 1 but with the sheet separating means in a position for handling sheets of a size much shorter than those shown in Figure 1; and

Figures 5 to 10 are diagrams depicting the sequence of the various steps and positions of the sheets and feeder elements as they occur during the operation of my feeder.

It will be understood that my improved feeder may be applied to any kind of sheet handling machine designed to operate on individual sheets. In the particular instance shown in the drawings, the separated and registered sheets are to be fed to an impression cylinder 10 of a printing press. This cylinder is driven in an anti-clockwise direction by means of the gear 11 which has motion imparted to it in the usual manner from the driving mechanism of the press. The registered sheets are conveyed to the grippers 12 of the cylinder 10, preferably by means of a transfer gripper mechanism 13 which may be actuated to stop in order that its sheet engaging grippers 14 shall engage a registered sheet while the sheet is at rest and then convey the sheet at an accelerating speed in order to transfer it to the cylinder grippers 12 at cylinder speed. A

mechanism whereby this may be accomplished is disclosed in my earlier U. S. Letters Patent No. 1,991,003, therefore I have omitted here the showing of any detailed mechanism whereby the sheet transfer means 13 may be actuated.

Referring now to those parts of the feeder which constitute the essential features of my invention, the pile 15 of sheets to be fed is supported on a pile table 16 associated with any convenient mechanism, not shown, for maintaining the top of the pile at a desired level. The top sheet is separated from the other sheets by means of suction shoes 17, any required number of which may be arranged along the rear edge of the pile 15, and which have a vertical movement so that the rear portion of the sheet, after it has been grasped by said shoes, shall be slightly raised off the pile. A blast of air will issue from the nozzles 18, either continually or in timed sequence, for the purpose of holding a separated sheet in suspension over the pile and directing it toward the suction forwarding roller 19, preferably termed the rear suction forwarder. At the moment the roller 19 grasps the sheet, the vacuum in the shoes 17 will have been broken to release the sheet, which latter will then commence its travel forward.

Along the front edge of the pile I have arranged a second suction roller 20, which may be termed the front forwarder, and which, like roller 19, rotates continually but in an anti-clockwise direction, has a peripheral speed slightly higher than that of the latter and the suction applied thereto is somewhat greater than that applied to the roller 19. The roller 20 engages the lower face of a separated sheet as it is advanced by the combined action of the roller 19 and the blast of air issuing from the nozzles 18, whereby the sheet is floated forward. It is apparent from the drawings that the nozzles 18, in addition to providing a blast of air, may also serve to hold down the sheets which remain on the pile after a sheet has been separated therefrom and while such sheet is being raised to the position depicted in said drawings. Therefore, these nozzles preferably have a vertical movement properly timed with the operation of the suction shoes 17, and they may also be given a rearward movement, all well known in the art, so that they may swing out of the path of the rear edge of a sheet while it is being raised above the pile, see the position indicated by broken lines in Figure 1.

After the suction roller 20 has engaged the sheet, the latter, due to the slightly slower speed of the roller 19, will be tautened and maintained taut during its continued forward travel, until its rear edge has passed beyond the roller 19. Inasmuch as the suction at the roller 20 is preferably somewhat greater than at the roller 19, the sheet is held under positive control for that period and a flat supporting surface is provided for the preceding sheet as will be explained later. Any slippage of the sheet occasioned by the slight difference in the surface speed of said rollers, will occur at the roller 19, thus the roller 20 holds the sheet under positive control during its forward travel.

Approximately at the time when the rear forwarder 19 releases the rear edge of the sheet, the leading edge of said sheet will have reached and thereupon covers the suction slide 21 which I preferably use for the purpose of effecting side registration of a sheet by moving it laterally against the side guides 22, see Figure 2. Upon

release of the suction in the slide 21, the sheet, after it has been side registered, will be finally advanced over the registering table 23 into contact with the front guides which in this event are provided on the sheet transfer member 13 in the form of projecting fingers 25. The leading edge of the registered sheet while stationary will then be engaged by the grippers 14, and thereafter transferred to the impression cylinder grippers 12 as stated above.

The suction roller 19, which is driven by the impression cylinder shaft through the intermediary of bevel gears 27 and 28, shaft 29 and helical gears 30 and 31, see Figure 1, can also be adjusted longitudinally of the feeder pile 15 in order to make possible the handling of stock of different length, see for instance Figure 4. For that purpose, the gear 30 is splined onto the shaft 29 by means of a key-way 35 provided in said shaft and by a key integral with said gear and projecting into said key-way.

The journals 36 and 37 of the roller 19 have their bearings in brackets 38 and 39, see Figure 2. Secured to the press frame in any suitable manner are two longitudinal slide ways or tracks 45 and 46 which extend above and along the side edges of the pile 15. The brackets 38 and 39 are mounted to slide within said tracks so that the roller 19 can be adjusted over the pile into any position to accommodate sheets of different length. In Figure 1 for instance, the roller is positioned for handling sheets of maximum length, whereas in Figure 4 the roller is placed closer to the front edge of the pile so that minimum length sheets can be successfully handled according to the principle of my invention. The brackets 38 and 39 and therewith the roller 19 are secured in their desired positions by means of set screws 47, 48 and 49, 50 respectively, which screws pass through suitable slots provided in the outer walls of said tracks.

As will be apparent from Figures 1 and 2, the roller 20, or front forwarder, derives its rotary motion also from the shaft 29. This is accomplished by means of a helical gear 51 secured to said shaft and meshing with a helical gear 52 mounted on a shaft 53. The latter carries a series of sprocket wheels 54 which are aligned with a corresponding series of sprockets 55 carried by the shaft 56 of the roller 20.

The table 23 is formed with recesses 60 to accommodate the sprockets 54 and sprocket chains 61 which connect the sprockets 55 in order to drive the shaft 56 and therewith the roller 20. An idler pulley 62 is provided for each chain whereby said chains are maintained taut. Each one of said chains carries a number of sheet aligning fingers 63 so positioned and timed that the leading edge of an oncoming sheet shall be aligned and maintained square to the path of the sheet on its way to the registering means. In Figures 1 and 4, the leading edge of the sheet B is shown in contact with one set of said aligning fingers, see also Figures 5 to 10 which depict the sequence of steps in the process of feeding sheets. It is evident of course that instead of the chains 61, one could use belts or tapes for driving the shaft 56 and which belts could be provided with fingers 63 for aligning the sheets before reaching the registering devices.

In Figure 3, one set of aligning fingers 63, with the sheet A abutting against them, is shown as having reached that position where the sheet is about to be taken over by the guide fingers 25 provided on the transfer mechanism 13 and

which fingers also serve to finally slow down and stop the sheets prior to being front registered. At the point shown, the member 13 has already assumed a decelerated speed, equal approximately to that of the oncoming sheet, so that when the fingers 63 pass beyond the guides 25, the leading edge of the sheet shall be smoothly taken over by the latter. It will be understood that the guide fingers 25 may merely serve to slow down the sheets and that any conventional front registering guides may be used to accomplish the final registration of the sheets.

Reciprocatory motion is imparted to the suction slide 21 preferably by the means illustrated in Figure 2. The slide is accommodated within a recess 65 formed in the top face of the registering table 23 and extending obliquely to the direction of travel of the sheets, said recess being of a length to permit free movement of the slide longitudinally of the recess. Adjacent one of its ends the slide is provided with a slot 66 to receive a block 67 which has a sliding fit within said slot. To this block is pivoted a connecting rod 68 which is supported by and slides within its bearing 69. The free end of this rod carries a cam roller 70 which rides within the groove 71 of the cam 72 which is rotated within its bearing 73 by the bevel pinion 75 through the intermediary of the companion bevel pinion 76 and gear 77 carried on the shaft 78, and the pinion 79 which is secured to the driven shaft 29. It will be seen, therefore, that by rotating the cam 72, the rod 68 and therewith the suction slide 21 shall be reciprocated. In order to clear the chains 61 during the reciprocatory movement of the slide 21, I provide recesses 80 in the upper face of said slide.

The position of the slide as depicted in Figure 2 is approximately half way between its full movement during its return or non-registering stroke. The speed at which the slide 21 is moved for side-registering a sheet, namely obliquely to the direction in which the oncoming sheets travel, is such that its component along the direction of travel of the oncoming sheet is equal to the speed at which a sheet moves at the time when the openings in the slide are entirely covered by the sheet and suction is applied to the sheet in order to hold it to the slide during the latter's side registering movement.

While I prefer to utilize a sliding suction member for the purpose of effecting side registration of the sheets, satisfactory results could also be obtained by using for example side registering devices which include a suction roller whereby a sheet to be registered is engaged and moved obliquely, i. e. in a forward and lateral direction, for the purpose of side registering it. Such a device is disclosed in the Stevens et al. U. S. Patent No. 2,085,833, and its divisional Patent No. 2,129,972.

I will now proceed to recite the sequence of the steps and conditions as they occur during the operation of my improved feeder, having particular reference to the diagrammatic showing of Figures 5 to 10 inclusive.

In Figure 5 the air nozzles 18 are down on the pile 15, thereby preventing any disturbing of the top sheets thereon. The suction separators 17 are also down in order to grasp the top sheet A, whereupon they lift the rear edge of the sheet past the nozzles 18 which by that time will have begun to issue a blast of air and have moved up and preferably backwards sufficiently to permit the top sheet to pass them, see Figure 1. The

blast of air will float the separated top sheet A, see Figure 6, so that the suction roller 17 will engage it and commence to forward the sheet upon release of the suction in the separators 17. It will be noted that the separated sheet is raised but slightly above the top of the pile, just enough to permit the nozzles 18 to move beneath it to float the sheet by the air blast issuing therefrom and to hold the next sheet B down. As the sheet A continues to travel forward, its leading edge will be maintained in alignment by the fingers 63 and gripped by the front forwarding roller 20 which, as I indicated above, has a peripheral speed slightly greater than that of the rear forwarder 19, and the suction applied thereto is preferably somewhat greater than that applied to the latter. Therefore, from the moment the sheet is engaged by the front forwarder 20, until it is released by the rear forwarder 19, it will be maintained taut and under positive control of the front forwarder.

In the position shown in Figure 7, the sheet A has passed partly over the registering table 23 and already has reached the side registering suction slide 21. In the meantime the suction shoes 17 have engaged and separated the sheet B from the pile and the nozzles 18 are directing a blast of air beneath it so that the sheet B will be floated against the roller 19 ready to be engaged thereby as soon as sheet A has passed beyond said roller.

When the leading edge of sheet B reaches the roller 20 it will be tautened immediately and thereby provide a flat supporting surface for the preceding sheet A while the latter continues its travel forward for side and front registration. The taut condition of sheet B is maintained until completion of the final front registration. In Figure 8 the sheet A is just about to engage the combined slow down fingers and front guides 25 carried by the rotary transfer gripper mechanism 13 and the rear portion of the sheet is still supported on the taut sheet B.

In Figure 9 the registration of the sheet A is completed, the grippers 14 have closed on the sheet and the transfer mechanism 13 is about to commence its rotation in order to transfer the registered sheet to the impression cylinder of the press. At that time the sheet B will have advanced sufficiently beyond the rear forwarder 19 so that the latter may engage the sheet C, which in the meantime has been separated and raised. Figure 10 shows the sheet A during its removal from the registering table 23, sheet B is about to be registered, sheet C is tautened and supporting sheet B, whereas sheet D is about to be separated and raised.

In the example illustrated, the timing of the sheet controlling elements is preferably as follows: The air blast issuing from the nozzles 18 is intermittent; vacuum is applied to the suction shoes 17 intermittently; the suction in the rear forwarder 19 is continuous; the suction applied to the front forwarder 20 also is continuous, and the suction in the slide 21 is intermittent.

I have not disclosed any specific means whereby the timing and volume of air pressure may be controlled, however, I contemplate using means similar to those illustrated and described in said U. S. Patents No. 2,085,833 and No. 2,129,972 which have proven efficient in practical use.

It will be apparent that a feeder such as I have disclosed herein shall offer marked advantages over the conventional sheet feeding mechanisms now in use, because the distance

over which a sheet has to travel from the pile to the registering guides is reduced to a minimum, thereby also permitting of having the least possible number of sheets in motion at the same time which will afford a better supervision and control of the sheets in transit. Furthermore, tained in substantially the same plane as the each sheet, as it travels to the guides, is main-top sheets on the pile. All of these features render the feeder extremely convenient to operate and when misfeeds occur, the feeder can be reset and again brought into operation without the loss of any sheets and with the minimum waste of time.

I claim:

1. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and feed them forward, sheet registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

2. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and forward them in substantially the same plane as the top of the pile of sheets on said support, sheet registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

3. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and feed them forward, sheet registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered, said pile support being located at a distance from said machine less than the length of the sheet to be handled thereby.

4. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and forward them in substantially the same plane as the top of the pile of sheets on said support, sheet registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered, said pile support being located at a distance from said machine less than the length of the sheet to be handled thereby.

5. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means mounted adjacent the rear edge of the pile for separating sheets, conveying means arranged intermediate the rear and front edges of said pile to engage separated sheets and feed them forward, sheet registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

6. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means mounted adjacent the rear edge of the pile for separating sheets, conveying means arranged intermediate the rear and front edges of said pile to engage separated sheets and feed them for-

ward, sheet registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered, said pile support being located at a distance from said machine less than the length of the sheet to be handled thereby.

7. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and feed them forward, means permitting adjustment of said latter means into different positions intermediate said front and rear edges, sheet registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

8. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means mounted adjacent the rear edge of the pile for separating sheets, conveying means arranged intermediate the rear and front edges of said pile to engage separated sheets and feed them forward, means permitting adjustment of said latter means into different positions intermediate said front and rear edges, sheet registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

9. Sheet feeding mechanism having in combination, means for separating sheets from a pile of sheets, rotating means disposed over said pile for advancing a separated sheet in a forward direction, and second rotating means located adjacent the front edge of said pile also operating to advance said separated sheet, both said rotating means operating to apply tension to said sheet, whereby said sheet is advanced with the portion between said two rotating means in taut condition, and providing a support for a preceding sheet that is in the course of being registered.

10. Sheet feeding mechanism having in combination, means for separating sheets from a pile of sheets, rotating means disposed over said pile for advancing a separated sheet in a forward direction and in substantially the same plane as the top of said pile, and second rotating means located adjacent the front edge of said pile also operating to advance said separated sheet, both said rotating means operating to apply tension to said sheet, whereby said sheet is advanced with the portion between said two rotating means in taut condition, and providing a support for a preceding sheet that is in the course of being registered.

11. Sheet feeding mechanism having in combination, means for separating sheets from a pile of sheets, rotating means disposed over said pile for advancing a separated sheet in a forward direction, and second rotating means located adjacent the front edge of said pile and also operating to advance said separated sheet, said second rotating means having a peripheral speed in excess of said first mentioned rotating means, whereby said sheet is advanced with the portion between said two rotating means in taut condition, and providing a support for a preceding sheet that is in the course of being registered.

12. In sheet feeding mechanism, the combination of means for separating sheets from a pile of sheets, spaced rotating means for ad-

vancing the separated top sheet, one of said rotating means having a peripheral speed different to that of the other rotating means, whereby said sheet is advanced under tension, and providing a support for a preceding sheet that is in the course of being registered.

13. In sheet feeding mechanism, the combination with a registering table, of means for feeding sheets in succession over said table for registering purposes, said means advancing said sheets in partially lapped relation and in a manner whereby one of said sheets is tautened to provide a flat supporting surface for the overlapping portion of the other sheet while the latter is being registered.

14. In sheet feeding mechanism, the combination with a registering table, of means for feeding sheets in succession over said table for registering purposes, said means advancing said sheets in partially lapped relation and in a manner whereby one of said sheets is tautened to provide a flat forwardly moving supporting surface for the overlapping portion of the other sheet while the latter is being registered.

15. In sheet feeding mechanism, the combination with a registering table of rotating means for feeding sheets in succession over said table for registering purposes, said means advancing said sheets in lapped relation and in a manner whereby one of said sheets is tautened to provide a flat supporting surface for the overlapping portion of the other sheet while the latter is being registered.

16. In sheet feeding mechanism, the combination with a registering table, of a pile of sheets, means for feeding sheets over said table for registering purposes, including means disposed over said pile for advancing two sheets simultaneously and in overlapped relation over said table, and other means located adjacent the front edge of said pile also advancing said sheets, the cooperation of both said means causing one of said sheets to tauten and maintain it taut for the purpose of providing a supporting surface for the overlapping portion of the other sheet, while the latter is being registered.

17. In sheet feeding mechanism, the combination with a registering table, of a pile of sheets, means for feeding sheets over said table for registering purposes including rotating means disposed over said pile for advancing two sheets simultaneously and in overlapped relation over said table, and other rotating means located adjacent the front edge of said pile also advancing said sheets, the cooperation of both said means causing one of said sheets to tauten, thereby providing a supporting surface for the overlapping portion of the other sheet while the latter is being registered.

18. In sheet feeding mechanism, the combination with a registering table, of a pile of sheets, means for feeding sheets over said table for registering purposes, spaced rotating means for advancing two sheets simultaneously and in overlapped relation over said table, one of said rotating means having a peripheral speed in excess of that of the other means, whereby one of said sheets is advanced under tension to maintain that portion of the sheet between said rotating means in taut condition, said tautened sheet thereby providing a flat supporting surface for the other sheet while the latter is being registered.

19. In sheet feeding mechanism, the combination with a registering table, of a pile of sheets, means for feeding sheets over said table for registering purposes, rotating means disposed over

said pile for advancing sheets successively and in partially lapped relation, the length of said registering table being less than the length of the sheets in said pile, and second rotating means located adjacent the front edge of said pile having operation to assist in the advancing movement of said sheets, the cooperation of both said means advancing each sheet in a manner to maintain the portion between said means in taut condition, to thereby provide a flat supporting surface for a preceding sheet while it is being registered.

20. In sheet feeding mechanism, the combination with a registering table, of a pile of sheets, means for feeding sheets over said table for registering purposes, rotating means disposed over said pile for advancing the sheets successively and in partially lapped relation, the length of said registering table being less than the length of the sheets in said pile, and other rotating means located adjacent the front edge of said pile having operation to assist in advancing movement of said sheets, said other rotating means having contact with the under surface of the advancing sheet.

21. In sheet feeding mechanism, the combination with a registering table, of a pile of sheets, means for feeding sheets over said table for registering purposes, rotating means disposed over said pile for advancing the sheets successively and in partially lapped relation, the length of said registering table being less than the length of the sheets in said pile, and other rotating means located adjacent the front edge of said pile having operation to assist in advancing movement of said sheets, said other rotating means having contact with the under-surface of an advancing sheet, the resulting operation of both said means advancing each sheet under tension, to thereby provide a flat, moving supporting surface for the preceding sheet while the latter is being registered.

22. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and feed them forward, sheet registering mechanism, means for prealigning each sheet before it reaches said registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

23. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and forward them in substantially the same plane as the top of the pile of sheets on said support, sheet registering mechanism, means for prealigning each sheet before it reaches said registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

24. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and feed them forward, sheet registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered and while it still extends over the pile.

25. In a sheet feeder for conveying sheets to

for separating sheets, conveying means arranged to engage separated sheets and feed them forward, sheet registering mechanism, means for maintaining in alignment each sheet before it reaches said registering mechanism, sheet slow-down means arranged to take over an oncoming sheet from said prealigning means, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

32. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and forward them in substantially the same plane as the top of the pile of sheets on said support, sheet registering mechanism, means for maintaining in alignment each sheet before it reaches said registering mechanism, sheet slow-down means arranged to take over an oncoming sheet from said prealigning means, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

23 33. In a sheet feeder for conveying sheets to
a sheet handling machine, a pile support, means
for separating sheets, conveying means arranged
to engage separated sheets and feed them forward,
30 sheet registering mechanism, means for
maintaining in alignment each sheet before it
reaches said registering mechanism, and means
cooperating with said conveying means to
tauten a sheet in order to thereby provide a
35 support for a preceding sheet that is in the course
of being registered, and while it still extends
over the pile, said pile support being located at a
distance from said machine less than the length
of the sheet to be handled thereby.

34. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and feed them forward, sheet registering mechanism, means including an endless member and sheet aligning elements for maintaining in alignment each sheet before it reaches said registering mechanism, sheet slow-down means arranged to take over an oncoming sheet from said prealigning means, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered, said pile support being located at a distance from said machine less than the length of the sheet to be handled thereby.

35. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged for separating sheets, conveying means arranged to engage separated sheets and feed them forward, sheet registering mechanism, means including an endless member and sheet aligning elements for maintaining in alignment each sheet before it reaches said registering mechanism, sheet slow-down means arranged to take over an oncoming sheet from said prealigning means, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered and while it still extends over the pile, said pile support being located at a distance from said machine less than the length of the sheet to be handled thereby.

75 36. In a sheet feeder for conveying sheets to a

31. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means 75

sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and feed them forward, sheet registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered, said tautened sheet being under positive control while said preceding sheet is being registered.

37. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and feed them forward, sheet registering mechanism including front guides and side guides, a suction slide arranged to engage a sheet to be registered and move it forwardly and laterally to thereby accomplish side registration of a sheet while moving towards said front guides, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

38. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and forward them in substantially the same plane as the top of the pile of sheets on said support, sheet registering mechanism including front guides and side guides, a suction slide arranged to engage a sheet to be registered and move it forwardly and laterally to thereby accomplish side registration of a sheet while moving towards said front guides, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

39. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and feed them forward, sheet registering mechanism including front guides and side guides, a suction slide arranged to engage a sheet to be registered and move it forwardly and laterally to thereby accomplish side registration of a sheet while moving towards said front guides, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered, said pile support being located at a distance from said machine less than the length of the sheet to be handled thereby.

40. In a sheet feeder for conveying sheets to a sheet handling machine, a pile support, means for separating sheets, conveying means arranged to engage separated sheets and feed them forward, sheet registering mechanism including front guides and side guides, a suction slide arranged to engage a sheet to be registered and move it forwardly and laterally to thereby accomplish side registration of a sheet while moving towards said front guides, means for pre-aligning each sheet before it reaches said registering mechanism, and means cooperating with said conveying means to tauten a sheet in order to thereby provide a support for a preceding sheet that is in the course of being registered.

41. In a sheet feeder of the class specified, having means for separating sheets from a pile and advancing them to registering means in lapped sequence, the provision of means where-

by that sheet which immediately succeeds the foremost sheet undergoing registration, is held under positive control during the registration of said foremost sheet.

42. In a sheet feeder of the class specified, having means for separating sheets from a pile and advancing them to registering means in lapped sequence, the provision of suction means whereby that sheet which immediately succeeds the foremost sheet undergoing registration, is held under positive control and moved forward during the registration of said foremost sheet.

43. The method of feeding sheets from a pile and registering them individually, comprising the steps of separating and advancing sheets successively and in partially lapped relation from a pile, applying tension to each sheet during the advancing movement thereof so that said sheet provides a flat supporting surface for the preceding sheet, and registering said preceding sheet while the same is supported at least in part by said supporting surface.

44. The method of feeding sheets from a pile and registering them individually, which comprises the steps of separating and advancing the top sheet of the pile, separating and advancing the second sheet while said top sheet is in partially lapped relation therewith, applying tension to said second sheet during the advancing movement thereof to provide a flat supporting surface for the top sheet, and registering said top sheet while the same is supported at least in part by said second sheet.

45. The method of registering sheets and feeding them in succession to a sheet handling machine, consisting in separating a sheet from a pile by suction and advancing it towards the machine, separating a succeeding sheet from said pile and advancing it towards said machine while still partly overlapped by the preceding sheet, tautening said succeeding sheet by suction to thereby provide a support for said preceding sheet, and registering said latter sheet while located on said tautened sheet.

46. The method of registering sheets and feeding them in succession to a sheet handling machine, consisting in separating a sheet from a pile and advancing it towards the machine, separating a succeeding sheet from said pile and advancing it towards said machine while still partly overlapped by the preceding sheet, tautening said succeeding sheet lengthwise and while still over said pile to thereby provide a support for said preceding sheet, and registering said latter sheet while located on said tautened sheet.

47. The method of registering sheets and feeding them in succession from a pile to a sheet handling machine, consisting in separating a sheet at its rear edge, raising said sheet above the pile and advancing it towards the machine, separating a succeeding sheet at its rear edge, raising it above said pile and advancing it while still partly overlapped by the preceding sheet, tautening said succeeding sheet while being advanced toward the machine to thereby provide a support for said preceding sheet, and registering said preceding sheet while located on said tautened sheet.

48. The method of registering sheets and feeding them in succession from a pile to a sheet handling machine, consisting in separating a sheet at its rear edge, raising said sheet above the pile and advancing it towards the machine, separating a succeeding sheet at its rear edge, raising it above said pile and advancing it while

still partly overlapped by the preceding sheet, tautening said succeeding sheet while being advanced toward the machine to thereby provide a support for said preceding sheet, maintaining in alignment and slowing down each sheet before it reaches the registering means, and registering said preceding sheet while located on said tautened sheet.

49. In a sheet feeder for conveying sheets to a sheet handling machine, which feeder comprises sheet registering means including front

5 guides, a feeder pile support, means for separating and feeding sheets from said support in lapped sequence, the novel combination of means for engaging and controlling a succeeding lapped sheet in a manner to render the same taut and thereby provide a support for a preceding sheet so that by the forward travel of the said succeeding sheet a preceding lapped sheet is caused to move into engagement with said front guides.

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BURT D. STEVENS.

CERTIFICATE OF CORRECTION.

Patent No. 2,313,100.

March 9, 1943.

BURT D. STEVENS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first column, line 7, strike out the syllable and words "tained in substantially the same plane as the" and insert the same before "top" in line 9; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 4th day of May, A. D. 1943.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.