May 26, 1942. J. F. JIROUSEK 2,284,430

SHEET FEEDING MECHANISM

Filed Nov. 30, 1940 3 Sheets-Sheet 1

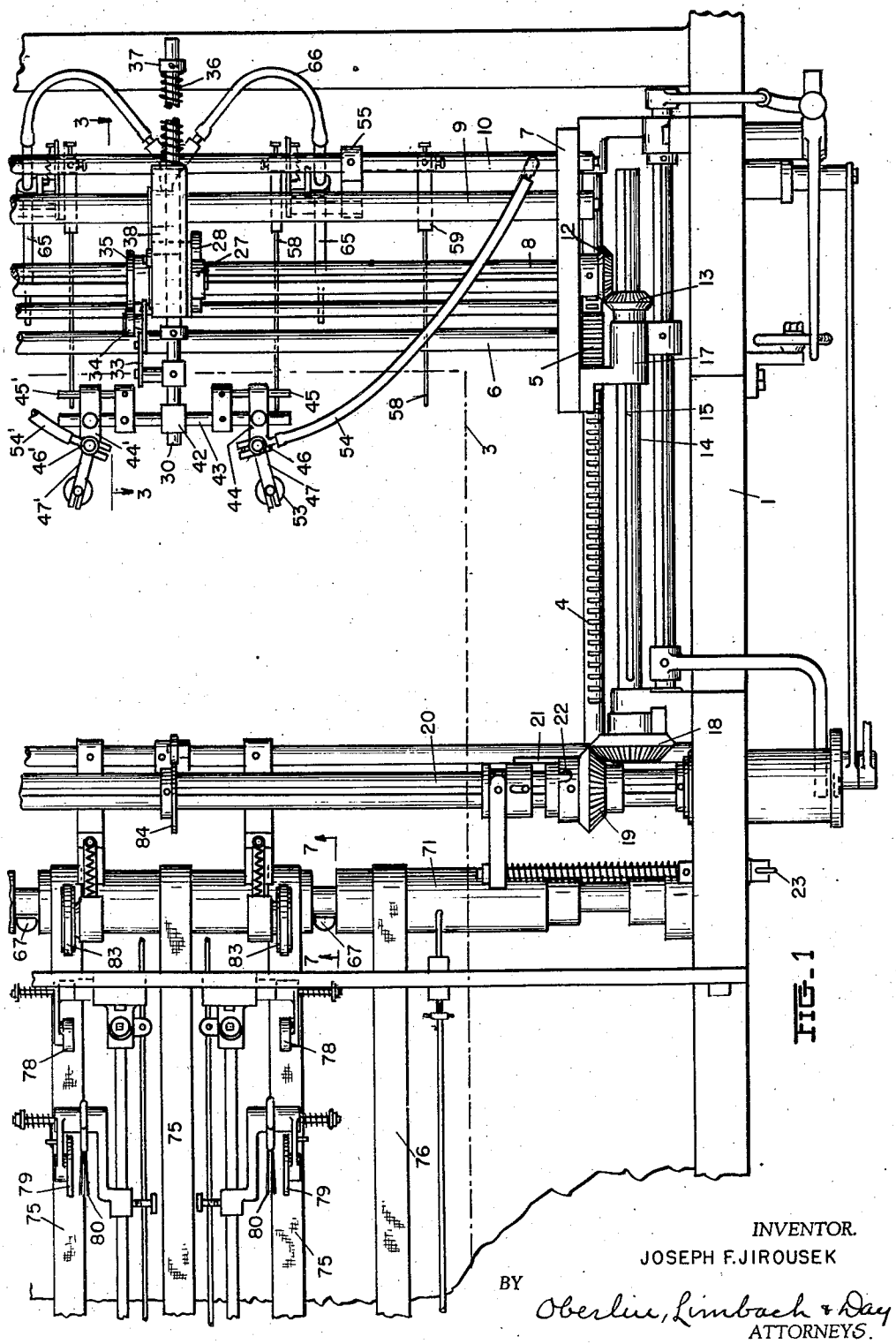


FIG. 1

INVENTOR.
JOSEPH F. JIROUSEK
BY Oberlin, Limbach & Day
ATTORNEYS.

May 26, 1942. J. F. JIROUSEK 2,284,430

SHEET FEEDING MECHANISM

Filed Nov. 30, 1940 3 Sheets-Sheet 2

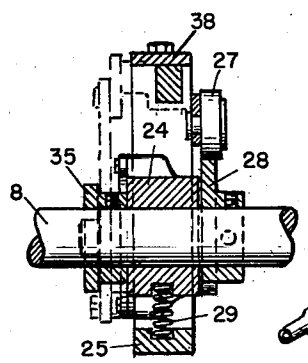


FIG. 2

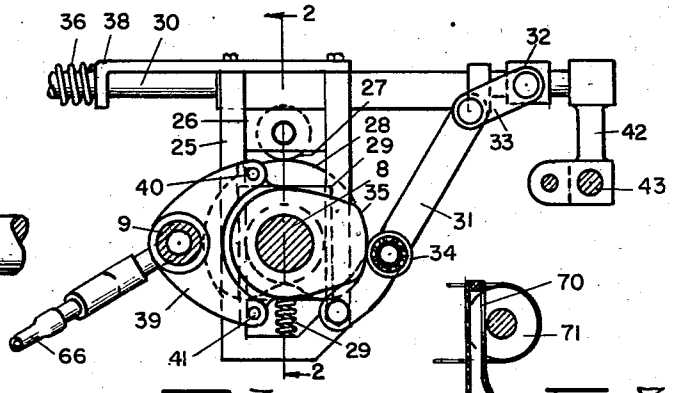


FIG. 3

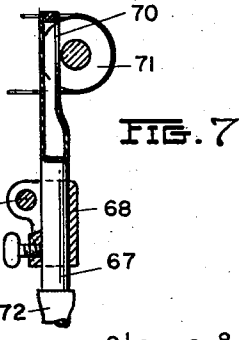


FIG. 7

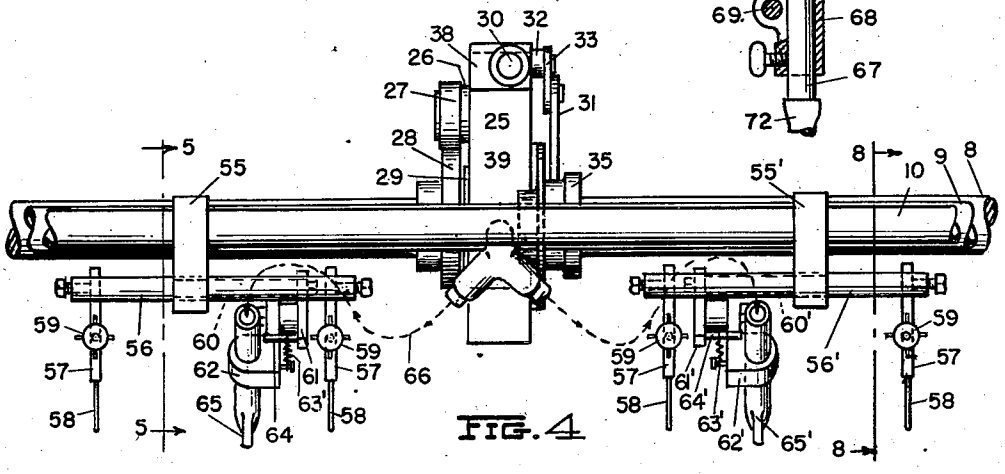


FIG. 4

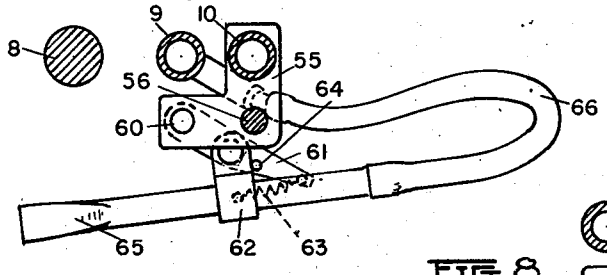
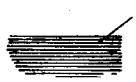


FIG. 5



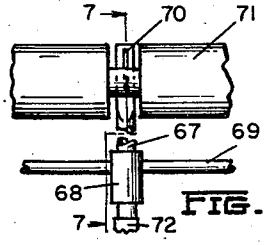


FIG. 6

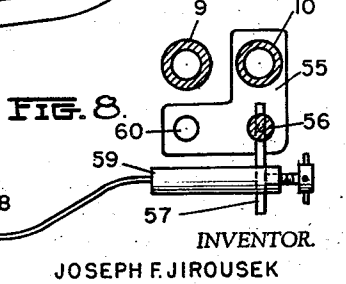


FIG. 8

INVENTOR.
JOSEPH F. JIROUSEK

BY Oberlin, Limbach & Dorf
ATTORNEYS.

May 26, 1942. J. F. JIROUSEK 2,284,430

SHEET FEEDING MECHANISM

Filed Nov. 30, 1940 3 Sheets-Sheet 3

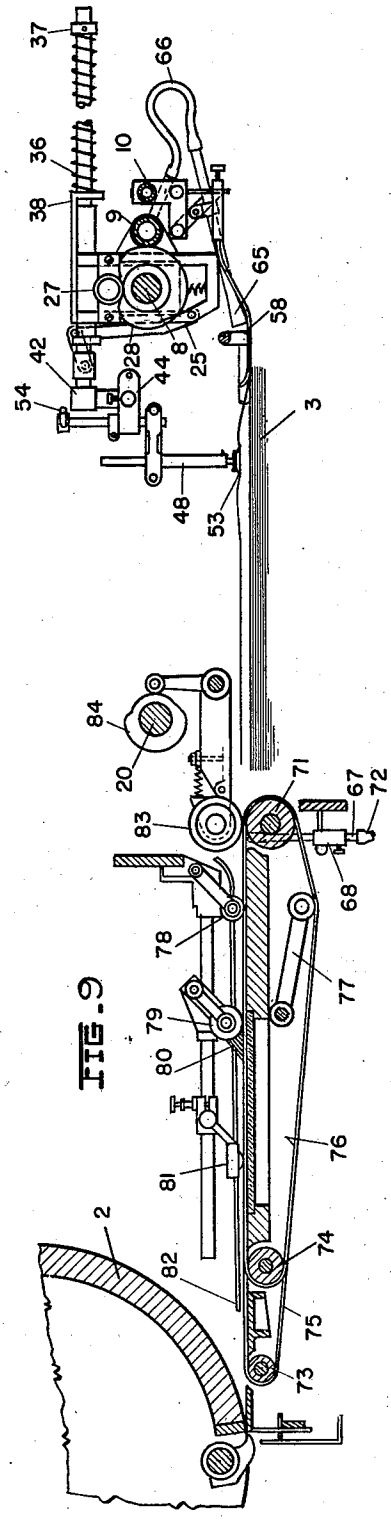


FIG. 9



FIG. 10

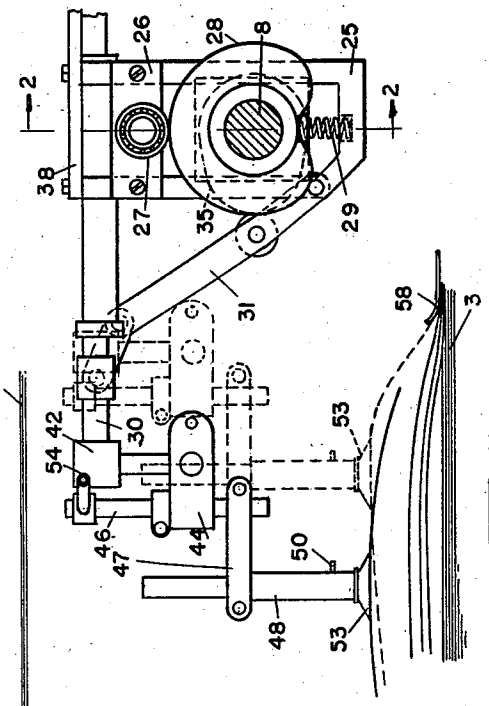


FIG. 13

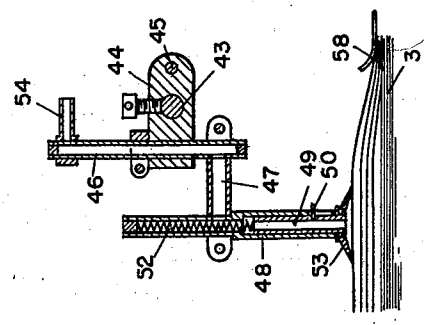


FIG. 12

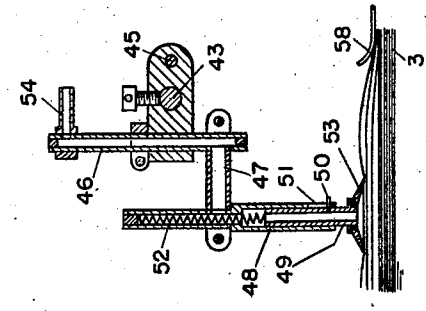


FIG. 11

INVENTOR.
JOSEPH F. JIROUSEK

BY
Oberlin, Limbach & Day
ATTORNEYS.

Patented May 26, 1942 2,284,430

UNITED STATES PATENT OFFICE

2,284,430

SHEET FEEDING MECHANISM

Joseph F. Jirousek, Cleveland, Ohio, assignor to The Chandler & Price Company, Cleveland, Ohio, a corporation of Ohio

Application November 30, 1940, Serial No. 367,993

12 Claims. (Cl. 271—12)

This invention relates, as indicated, to feeding mechanism for printing presses, and especially presses of the lithographic or offset type. This invention is also concerned with a new and improved method of feeding sheets whereby such sheets may be forwarded in lapped relation.

This application is a continuation in part of my co-pending application Serial No. 299,308, filed October 13, 1939, to which reference may be had for those details of construction with which the present invention is not primarily concerned.

The primary object of this invention is to provide a sheet feeding mechanism adapted to separate and advance a large number of sheets in a short space of time without the necessity of overly rapid movement of such sheets en route from the stack to the impression cylinder.

Another object is to provide such mechanism which is simple in construction and may be adjusted for efficient use without the exercise of unusual skill.

A further object of this invention is to provide a method of separating sheets in a stack which will be rapid and positive in action.

Still another object is to provide such a sheet separating mechanism which is particularly suited to be employed in conjunction with conveying mechanism adapted to advance the sheets in underlapped relation.

Other objects of this invention will appear as the description proceeds.

To the accomplishment of the forgoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims, the annexed drawings and the following description setting forth in detail certain means and one mode of carrying out the invention, such disclosed means and mode illustrating, however, but one of various ways in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a fragmentary top plan view of the feeding mechanism of this invention;

Fig. 2 is a sectional view of the cam mechanism operating the sheet picker means, taken along the line 2—2 on Fig. 3;

Fig. 3 is a side elevational view of such operating mechanism taken along the line 3—3 on Fig. 1;

Fig. 4 is a rear elevational view of the sheet picker mechanism with attendant air blast and hold-down means;

Fig. 5 is a sectional view along the line 5—5 on Fig. 4, showing one of such air blast means;

Fig. 6 is an elevational view of the rear roller of the sheet conveyor illustrating the position of the air blast means at the forward edge of the stack;

Fig. 7 is a sectional view through such air blast means taken along the line 7—7 on Fig. 5;

Fig. 8 shows one of the hold-down means at the rear edge of the stack and is taken along the line 8—8 on Fig. 4;

Fig. 9 is a sectional side elevational view of the sheet feeding mechanism of this invention showing the path of movement of the sheet from stack to impression cylinder;

Fig. 10 is a somewhat diagrammatic illustration of the sheets in process of being conveyed, showing their underlapping relationship;

Fig. 11 is a somewhat diagrammatic sectional view showing a sucker tip seizing the top-most sheet of the stack;

Fig. 12 is a view similar to Fig. 11, showing the position of such sucker mechanism immediately atfer vacuum has been applied thereto; and

Fig. 13 shows the further path of movement of the sucker tip.

Referring now more particularly to said annexed drawings, the sheet feeding mechanism of this invention comprises sheet picker means adjustably mounted on the frame 1 of the press and sheet conveying means for transporting the sheets to the impression cylinder 2.

The sheet picker assembly is constituted as follows: Attached solidly to the frame 1 of the press and on either side of the feed table which supports a stack 3 are racks such as 4 on which move pinions such as 5. At each end of pinion shaft 6 and supported on sleeves embracing said racks are end members such as 7 which carry cross shafts 8, 9 and 10 therebetween. Shafts 9 and 10 are hollow, shaft 9 being adapted to carry compressed air and shaft 10 being connected to a vacuum line. Shaft 8 is rotatably mounted in bushings in end members 7 with a bevelled gear 12 at one end. Engaging said gear is another bevelled gear 13 slidably keyed to shaft 14 by means of a groove 15 in said shaft. Gear 13 may be fixedly positioned on such shaft by means of a set screw which effectively prevents movement of such pinions on such racks in a direction toward said impression cylinder. Movement in the other direction is prevented by a sleeve 17 about shaft 14 which is bolted to the end member 7. By means of bevelled gears 18 and 19 power is derived from the cross drive shaft 20 when the

pin 21 is in engagement with the slot 22 in gear 19. Conventional clutch means controlled by lever handle 23 is employed to effect such an engagement and disengagement.

Slidably positioned on shaft 8 is the sheet picker means of this invention. Such means comprises a rectangular block 24 mounted on shaft 8 and reciprocable within a U-shaped member 25. The upper portions of the arms of such U-shaped member are bridged by a plate 26 carrying a cam roller 27 which rides on cam 28 and thus supports such U-shaped member 25. A coil spring 29 keeps roller 27 and cam 28 in close engagement. Piercing the upper ends of such U-shaped member and sildably mounted therein is a rod 30. A member 31 is pivotally attached to the lower portion of such U-shaped member and connected to a stud 32 on rod 30 by means of the link 33. A roller 34 is mounted on said member 31 in position to engage cam 35, which, upon rotation, thus acts to reciprocate rod 30.

A coil spring 36 is compressed between terminal stop 37 and bracket 38 attached to such U-shaped member and serves to maintain roller 34 in constant engagement with cam 35. A crescent-shaped arm 39, attached to block 24 by two pins 40 and 41, embraces shaft 9 and thus prevent pivotal movement of the whole picker assembly about shaft 8. It will now be seen that rotation of shaft 8, with consequent rotation of cams 28 and 35, will result in both vertical and horizontal reciprocation of rod 30 and the sheet picker means carried thereby, as more particularly described below.

A clamping member 42 attached to the forward end of rod 30 carries a laterally extending rod 43 in turn supporting bracket members 44 and 44' adjacent its respective ends. Such brackets are laterally adjustable along rod 43, rods 45 and 45' serving as guideways and preventing pivotal rotation of such brackets. Vertical tubes 46 and 46' are carried forwardly in such brackets and communicate by horizontal extensions 47 and 47' with vertically disposed suction tubes such as 48. A tubular piston or plunger 49 is fitted within the lower portion of tube 48 with a pin 50 serving as a stop in slot 51 to limit the degree of reciprocation permitted thereto. A coil spring 52 in the upper portion of tube 48 tends to urge such plunger downwardly to the degree permitted by such stop. A rubber sucker tip 53 is provided on the lower end of such plunger which protrudes from tube 48. Suction lines 54 and 54' are also provided, joining the upper ends of tubes 46 and 46' with hollow shaft 10 which is adapted to have vacuum intermittently applied thereto. It will of course be understood that more than two of these sheet picker units may be employed if the size of the sheet being handled should render such desirable. As best shown in Figs. 4, 8 and 9, hold-down means are provided to bear at spaced intervals on the upper surface of the stack adjacent the rear edge thereof. Brackets 55 and 55' are mounted on shaft 10 and carry laterally extending rods 56 and 56'. Adjacent the ends of such last-named rods are small vertically disposed rods 57 to which the hold-downs proper may be clamped. Such hold-downs comprise wire spring members 58 set in blocks 59 adapted to be adjustably positioned on such vertical rods 57 in order to obtain the desired degree of pressure on the rear edge of stack 3 (see Fig. 8).

Also carried in such brackets 55 and 55' are rods 60 and 60' carrying arms 61 and 61' at their respective ends. Clamping members 62 and 62' are pivotally mounted on such arms with springs 63 and 63' tending to hold such clamps in engagement with stops 64 and 64'. Air blast tubes 65 and 65' are carried in such clamps and are connected by rubber tubing such as 66 with hollow shaft 9 to which air pressure is adapted to be intermittently applied. The position of such rubber tubes is shown in Fig. 4 by means of dash lines to avoid obscuring other portions of the drawings.

Air blast means is also provided adjacent the forward edge of the stack, such means being best illustrated in Figs. 1, 6 and 7. The hollow tube 67 is adjustably held in clamp 68 mounted on cross rod 69. The upper end of such tube is closed and a vertcal slit 70 is provided toward the forward edge of the stack. Conveyor roller 71 is cut away except for a core portion so that it may not unduly block the air blast. Rubber tubing 72, connected to the lower end of tube 67, communicates with an air pressure source adapted to provide intermittent blasts of air thereto.

Conveyor means is provided for forwarding the sheet from the stack to the impression cylinder 2. While such means is fully disclosed in my aforesaid application Serial No. 299,308, it may be briefly described as follows. A drive roller 71 is provided adjacent the forward edge of the stack and freely rotatable shafts 73 and 74 are provided adjacent the impression cylinder. Three woven tape belts 75 pass about shaft 71 and freely turning shaft 73. Two other belts, such as 76, one on each side of the aforesaid belts, pass about shaft 71 and freely turning shaft 74. Tension in said belts is maintained by means of a belt tightener 77. Hold-down means comprising rollers 78, rollers 79, brushes 80 and freely rotatable balls 81, are adapted to rest on the sheets as they are forwarded in underlapping succession to the impression cylinder. Rods 82 further serve to keep the sheets in position. A resiliently mounted roller 83 is adapted to be intermittently raised and lowered by action of a cam 84 mounted on shaft 20. Such movement of this roller is timed so that the roller may be raised when the forward edge of a sheet is in process of being presented to the conveyor.

The operation of the device of the present invention may be now understood by referring to Figs. 9 to 13 inclusive. The air blasts both at the forward and rear edges of the stack come on causing several of the uppermost sheets of the stack to become separated from each other and partially floated. The rear edges of such sheets are, however, retained beneath hold-downs 58 and, after forwarding of the sheets has been commenced, the forward edge of the topmost sheet of the stack will be held beneath the rear portion of the next preceding overlapping sheet in process of being forwarded. As shaft 8 revolves, the cam mechanism above described causes the sheet picker mechanism to descend and suckers 53 to contact the rear portion of the topmost sheet, as shown in Fig. 2. Suction is then applied to such sucker tips causing the same to seize the sheet, and plunger 49 is then at once abruptly retracted in tube 48 by action of the vacuum resulting when the sucker orifice is closed by the sheet, as shown in Fig. 12, elevating the body of such topmost sheet considerably above the subjacent sheets. As shaft 8 continues to turn, the cam mechanism causes

the sucker tips to rise to the position illustrated in dash line in Fig. 13. At this point the air blasts are turned off and rotation of cam 28 causes the picker mechanism to be advanced, withdrawing the rear edge of the topmost sheet from beneath hold-downs 58 and sliding the forward edge of the sheet onto the conveyor, roller 83 being elevated at this point. When the forward portion of the sheet is between rollers 83 and 71, roller 83 descends to resiliently press the sheet on the conveyor belts. Hold-downs 58 are of course now bearing upon the rear edge portion of the next succeeding sheet on the stack, preventing displacement of the same. The suction is then turned off, permitting the suckers to release the sheet and the sheet picking mechanism returns to position to repeat the cycle. The sheets will preferably be forwarded in underlapping relationship, as illustrated diagrammatically in Fig. 10, it being noted that the sheets are forwarded at such intervals that portions of three successive sheets are desirably superimposed. It will of course be understood that the relationship of one sheet to the next may be modified as desired by proper timing of the sheet picker and conveyor mechanism.

From the foregoing it will be readily seen that the sheet feeding mechanism of this invention is relatively simple both in construction and operation, and when once properly adjusted requires very little further attention. The stack of sheets is of course elevated in the usual manner as sheets are removed from the top thereof in order that the upper level of the stack may be substantially even with, or a trifle below, the sheet forwarding conveyor. Also, with certain types of sheets, the rear air blasts may not be required, although generally desirable.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the means and the steps herein disclosed, provided those stated by any of the following claims or their equivalent be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In sheet feeding mechanism for printing presses and the like, suction means operative to seize, elevate and advance the top-most sheet of a stack, and air-blast means positioned to direct blasts of air against the forward and rear edges of such stack operative during the elevation of such sheet.

2. In sheet feeding mechanism for printing presses and the like, suction means operative to seize and abruptly elevate the top-most of a stack, hold-down means at the rear edge of such stack, means for advancing said suction means and thus such sheet, and air-blast means positioned to direct blasts of air against the forward and rear edges of such stack operative during the elevation of such sheet.

3. In sheet feeding mechanism for printing presses and the like adapted to feed sheets in lapped relation, hold-down means operative to bear on the rear edge of a stack of sheets, air-blast means positioned to direct blasts of air against the forward and rear edges of such stack and operative to separate the top-most sheet from the next subjacent sheet of the stack, and suction means operative to seize, abruptly elevate, and advance such sheet.

4. In sheet feeding mechanism for printing presses and the like, suction means adapted to seize and abruptly elevate a sheet comprising a vertically disposed cylinder, a tubular piston therein having its lower end protruding therefrom, means limiting the degree of reciprocation permitted to said piston, resilient means within said cylnder tending to force said piston downwardly, a sucker tip on such protruding end, and a vacuum line connecting with said cylinder.

5. In sheet feeding mechanism for printing presses and the like, means for initially separating the top-most sheet of a stack from its next subjacent sheet comprising a hold-down adapted to bear on the rear edge of such stack, and air-blast means disposed in position to direct blasts against the rear and forward edges of such stack and adapted to be operated while the forward edge of such top-most sheet is still overlaid by the preceding sheet in process of being forwarded.

6. The method of feeding sheets to a printing press or the like which comprises blowing against the rear and forward edges of a stack to separate the top-most sheet from the next subjacent sheet of such stack, abruptly elevating the rear portion of such sheet by suction means, and advancing such sheet while the forward edge of such sheet is still overlaid by the preceding sheet in process of being forwarded.

7. The method of feeding sheets to a printing press or the like which comprises blowing at the rear and forward edges of a stack to initially separate the top-most sheet from the next subjacent sheet of such stack, the forward edge of such top-most sheet being still overlaid by the preceding sheet in process of being forwarded and the rear edge of such top-most sheet being confined by hold-down means, abruptly elevating the rear portion of such top-most sheet by suction means, discontinuing such blowing, and advancing such sheet by action of such suction means in underlapped relationship to such next preceding sheet.

8. The method of feeding sheets to a printing press or the like which comprises blowing at the forward edge of a stack to initially separate the top-most sheet from the next subjacent sheet of such stack, the forward edge of such top-most sheet being still overlaid by the preceding sheet in process of being forwarded and the rear edge of such top-most sheet being confined by hold-down means, abruptly elevating the rear portion of such top-most sheet by suction means, discontinuing such blowing, and advancing such sheet by action of such suction means in underlapped relationship to such next preceding sheet.

9. In a method of feeding sheets from a stack to a printing press or the like, the steps comprising blowing the forward edge of such stack, holding down the rear edge of the topmost sheet of such stack whereby the rear portion of such topmost sheet may be upwardly bulged, seizing such bulged portion with suction means, and abruptly elevating such means.

10. The method of feeding sheets from a stack to a printing press or the like which comprises blowing the forward edge of such stack, holding down the rear edge of the topmost sheet of such stack whereby the rear portion of such topmost sheet may be upwardly bulged, seizing such bulged portion with suction means, elevating such means whereby to elevate the rear portion of such sheet, and advancing such sheet while the forward edge thereof is still overlaid by the next preceding sheet in process of being forwarded.

11. The method of feeding sheets from a stack to a printing press or the like which comprises blowing the forward edge of such stack, holding down the rear edge of the topmost sheet of such stack whereby the rear portion of such topmost sheet may be upwardly bulged, seizing such bulged portion with suction means, abruptly elevating such means whereby to ensure separation of the rear portion of such sheet from the next subjacent sheet, and advancing such sheet while the forward edge thereof is still overlaid by the next preceding sheet in process of being forwarded.

12. The method of feeding sheets from a stack to a printing press or the like comprising the steps of blowing the forward edge of such stack to separate the body of the top-most sheet from the stack, the rear edge of said sheet being held down by hold-down means and the forward edge of said sheet still overlaid by a portion of the next preceding sheet in process of being forwarded, and seizing the said top-most sheet by suction means and advancing the same in underlapped relationship to such next preceding sheet.

JOSEPH F. JIROUSEK.