Oct. 15, 1940. W. E. SCHNEIDER 2,218,484

SHEET FEEDING APPARATUS

Filed Sept. 16, 1939 2 Sheets-Sheet 1

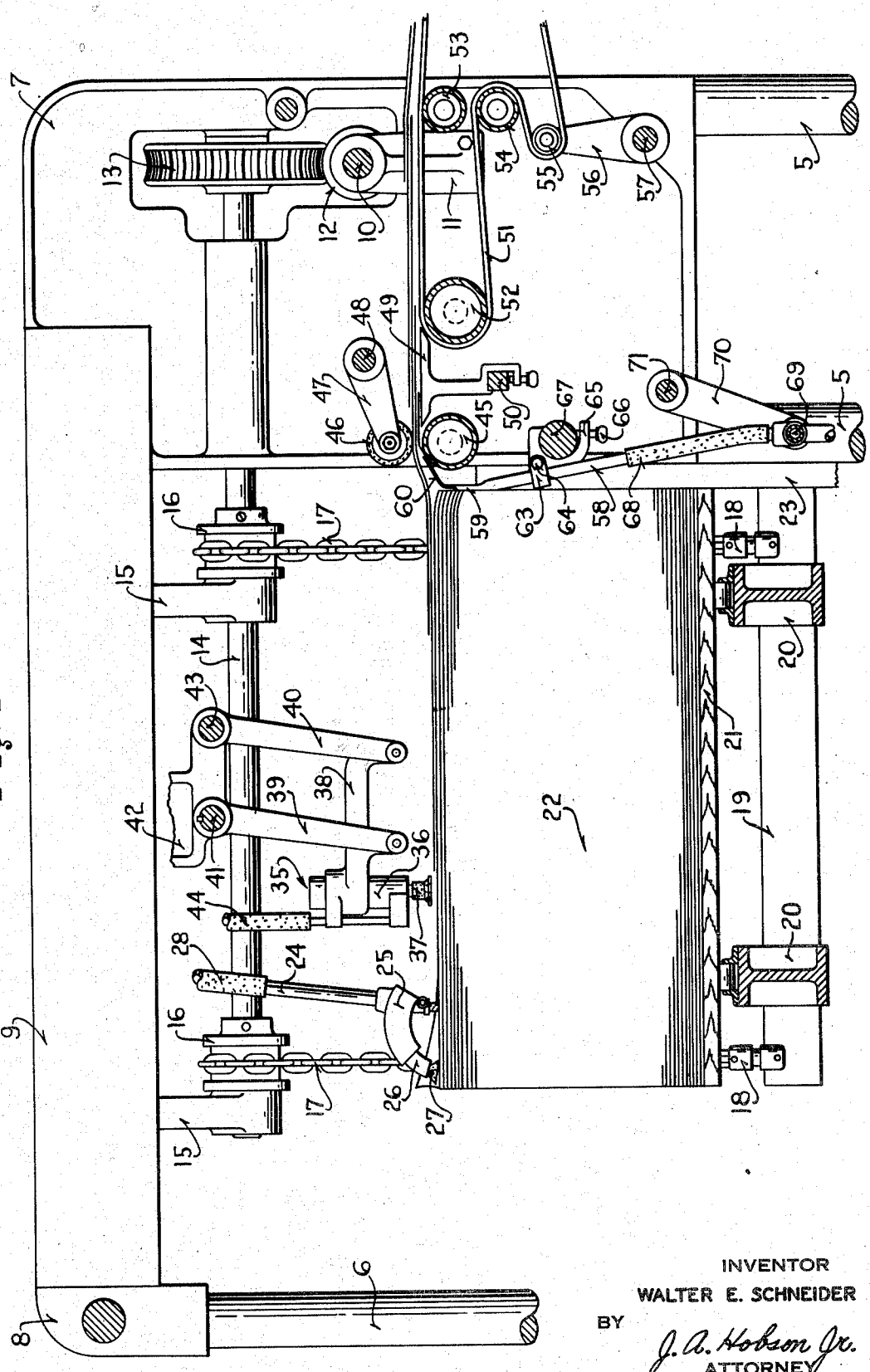


Fig. 1

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Fig. 2

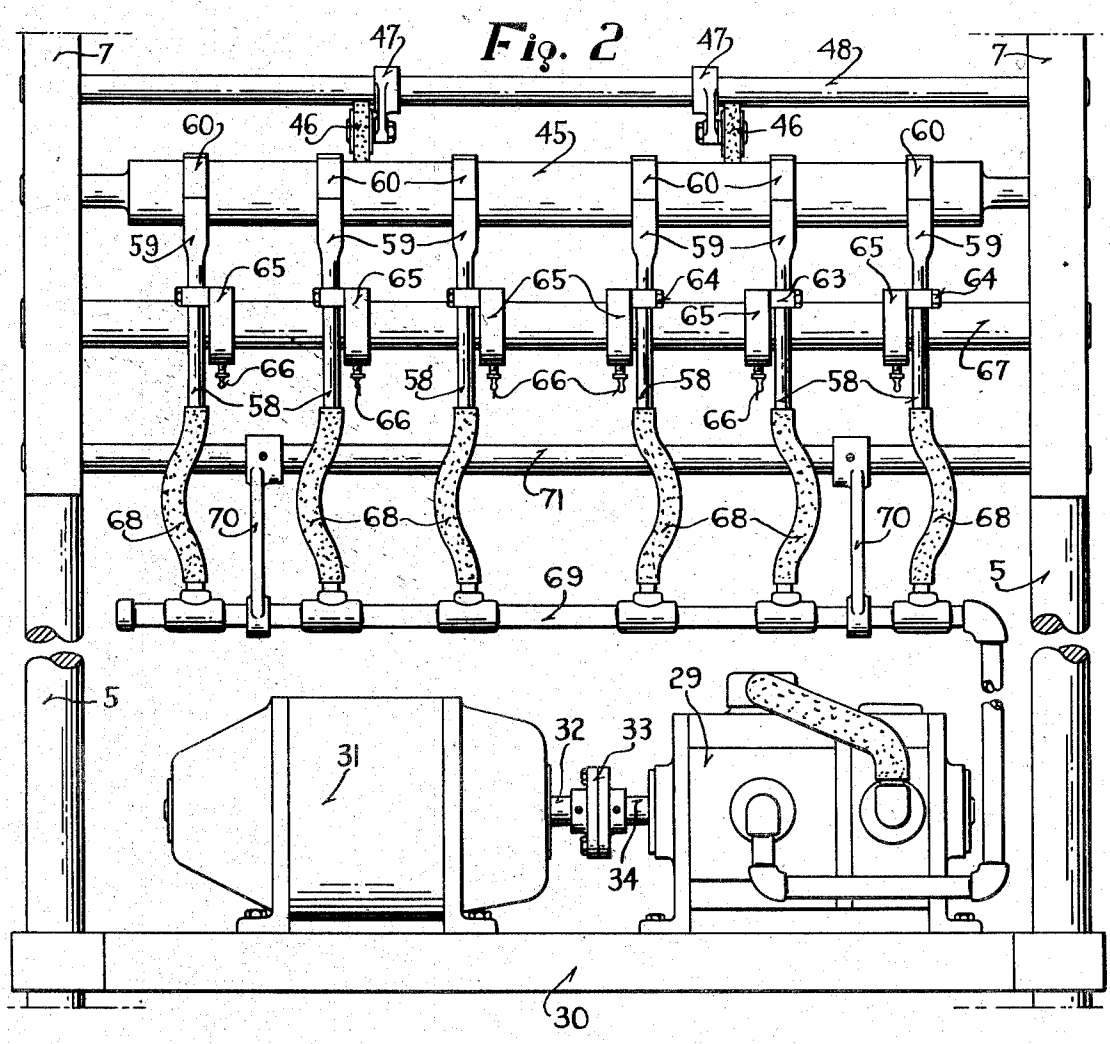


Fig. 3

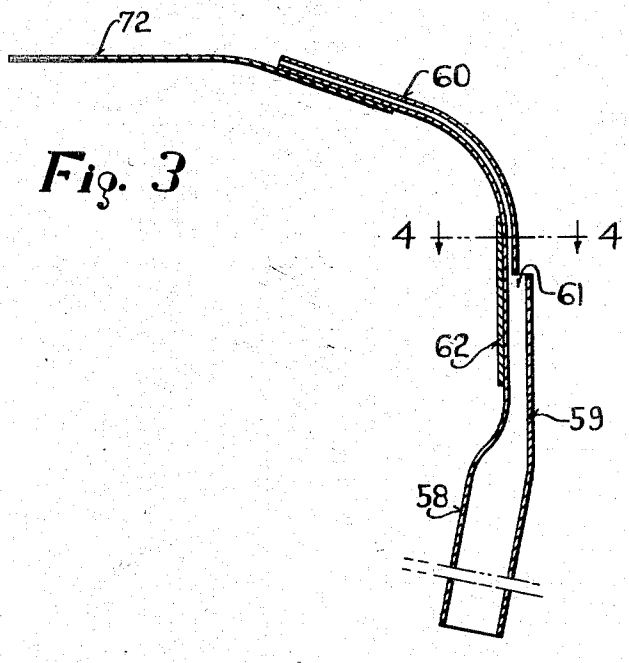
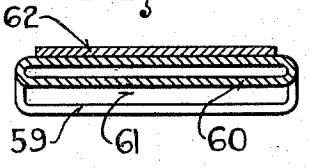


Fig. 4



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SHEET FEEDING APPARATUS

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Application September 16, 1939, Serial No. 295,214

7 Claims. (Cl. 271—26)

This invention relates to sheet feeders and while capable of general use is more particularly adapted to types of feeders known as "stream feeders" wherein the sheets are advanced in lapped relation from a supply to a printing press or other instrumentality with which the feeder is associated.

One object of the present invention is to provide an improved sheet feeder of the "stream" type which will efficiently feed sheets having downwardly curled front edges from a pile or supply to a conveyor associated therewith.

Another object of the present invention is to provide a sheet feeder having novel means for preventing downwardly curled front sheet edges from "fouling" on a conveyor when the sheets are delivered thereto from a pile or supply by sheet forwarding devices operable on the rear portions of the sheets.

Another object of the present invention is to provide an improved sheet feeder wherein the front edges of the sheets are subjected to vertically and horizontally directed currents of air to prevent said edges, particularly downwardly curled edges, from "fouling" on a conveyor when the sheets are delivered thereto from a pile or supply by sheet forwarding devices operable on the rear portion of the sheets.

These and other objects of the present invention will appear as the following description thereof proceeds, and in order to more clearly understand said invention reference may be had to the accompanying drawings which illustrate one embodiment thereof.

In said drawings:

Fig. 1 is a fragmentary side elevation, partly in section, of a sheet feeder embodying the present invention;

Fig. 2 is a fragmentary rear elevation of the feeder shown in Fig. 1 with parts omitted for purposes of clearer illustration;

Fig. 3 is an enlarged vertical sectional view of a sheet raising and guiding device shown in Figs. 1 and 2; and

Fig. 4 is a horizontal sectional view on the line 4—4 of Fig. 3.

Referring to the drawings, wherein like reference characters designate like parts throughout the several views, 5 indicates the front uprights and 6 the rear uprights of a frame of the feeder, the front uprights 5 having heads 7 bolted or otherwise suitably secured thereto and the rear uprights 6 having heads 8 bolted or otherwise suitably secured thereto. The front and rear heads 7 and 8 are connected together by side members 9 which are bolted or otherwise suitably secured thereto.

Extending transversely of the feeder and driven from any suitable source of power is a shaft 10 each end of which is journalled in a bracket 11 bolted or otherwise suitably secured to the adjacent head 7. Fixed on opposite ends of the shaft 10 are worms 12 which mesh with worm gears 13 that are fixed on corresponding ends of shafts 14. The shafts 14 extend longitudinally of the feeder at opposite sides thereof and are journalled in suitable bearings formed in the heads 7 and in brackets 15 which are bolted or otherwise suitably secured to the side members 9.

Fixed on the shafts 14 are toothed sheaves 16 in the teeth of which are engaged links of chains 17 that are connected at their lower ends by couplings 18 to the side members 19 of a pile elevator including cross beams 20 adapted to receive and support a pile board 21 and pile of sheets 22 thereon. The shaft 10 is intermittently rotated in the usual manner by any well known means for this purpose to raise the elevator step by step in order to maintain the top of the pile at a proper level and thus insure continued and accurate separation and feeding of the sheets from the top of said pile. During step by step upward movement of the elevator, the front of the pile is guided by spaced pile guides 23 which are supported in any suitable manner on the feeder frame.

The sheets of pile 22 are separated one after another from the top of the pile at the rear and opposite sides thereof by sheet separating mechanisms preferably of the general type disclosed in the application of Edwin W. Goodwin, Serial No. 267,963, filed April 15, 1939. These sheets separating mechanisms include suction devices each comprised by a conduit 24, an arcuate housing 25 connected therewith, and a tubular arcuate member 26 slidable in the housing 25 and provided on the lower end thereof with a rubber suction cup 27. Vacuum is created in the arcuate housings 25 at predetermined intervals to cause the suction cups 27 to grip opposite rear corners of each successive sheet and lift the rear edge thereof above the level of the pile. For this purpose, the conduits 24 have connected therewith corresponding ends of flexible conduits 28 the opposite ends of which are connected with a suitable valve mechanism (not shown) that, in turn, is connected in any suitable manner with the vacuum side of a pump 29.

The pump 29 is bolted or otherwise suitably secured to cross rails 30 which are secured in any

suitable manner on the front uprights 5 at opposite sides of the feeder. The cross rails 30 have bolted or otherwise suitably secured thereto an electric motor 31 the armature shaft 32 of which is connected as by a coupling 33 with the shaft 34 of the pump 29 to drive said pump.

Prior to release of the separated and lifted sheets by the suction cups 27, said sheets are gripped at the rear thereof by suction forwarding devices indicated broadly at 35 which are preferably mounted, constructed and operated in the same manner as the suction sheet forwarding devices disclosed in the application Serial No. 267,963 mentioned above. These sheet forwarding devices are comprised by cylinders 36 and rubber suction cups 37 which are vacuum operated in opposite directions to engage and lift each separated sheet. The cylinders 36 are carried in the free ends of horizontal arms 38 which are pivotally connected to the lower ends of vertically extending parallel arms 39 and 40 that impart horizontal reciprocating motion to the suction sheet forwarding devices 35. The arms 39 are adjustably secured to a transversely extending rock shaft 41 which is journalled in suitable bearings in brackets 42 at opposite sides of the feeder, and the arms 40 are rotatably mounted on a transversely extending shaft 43 that is secured in said brackets. The cylinders 36 are connected by flexible conduits 44 with the vacuum side of the pump 29, and through the provision of suitable valve mechanism (not shown) vacuum is created at proper predetermined intervals in said cylinders to cause the suction cups 37 to grip each sheet lifted by the separator suction cups 27.

Each sheet gripped by the suction devices 35 is forwarded from the pile, when released by the suction cups 27, and delivered thereby under and in lapped relation with a preceding sheet to conveying means continuously driven at slow speed to enable lapping of the sheets thereon. This conveying means advances the lapped sheets to a printing press or other instrumentality with which the feeder is associated, and as herein shown, said conveying means is preferably constructed and operated as follows.

Extending transversely of the feeder and journalled in suitable bearings in the front heads 7 is a feed roller 45 the upper surface of which lies in a plane somewhat higher than the normal feeding level of the pile of sheets 22. This feed roller 45 is rotated continuously and at slow speed by any suitable source of power connected therewith. Located above the feed roller 45 are pressure rollers 46 which cooperate with said feed roller to receive the forwarded sheets in lapped relation and feed a stream of the lapped sheets forwardly. The pressure rollers 46 are journalled on arms 47 which are adjustably secured to a cross shaft 48 that is fixed in the front heads 7. The stream of lapped sheets is fed by the rollers 45 and 46 over a plurality of fingers 49 which are spaced apart transversely of the feeder forwardly of said rollers. The fingers 49 are adjustably clamped to a cross bar 50 which is secured in any suitable manner on the front heads 7.

The stream of lapped sheets advanced over the fingers 49 is delivered on to continuously driven, slow moving tapes 51 that convey the stream of lapped sheets to a printing press or other machine with which the feeder is associated. The front ends of the tapes 51 pass around a suitable roller or rollers (not shown) adjacent the printing or other machine, and the rear ends of said tapes pass around and are driven by a roller 52 having the same surface speed of rotation as that of roller 45 and driven from any suitable source of power. The roller 52 is journalled in suitable bearings in the front heads 7 and the tapes 51 which pass around said roller also pass over an idler roller 53 and around an idler roller 54 and tightening rollers 55. The idler rollers 53 and 54 extend transversely of the feeder and are journalled in any suitable manner on the front heads 7. The tightening rollers 55 are journalled on arms 56 which are adjustably secured on a cross shaft 57 that is fixed in the front heads 7.

In accordance with the present invention the sheet feeder is provided with novel means for raising and guiding the front edges of the sheets between the rollers 45 and 46 and over the fingers 49 to prevent said edges, particularly when they are curled downwardly as shown in Fig. 1 of the drawings, from "fouling" on the feed roller 45 and on the rear edges of the fingers 49. As herein shown, said means is comprised by a plurality of spaced apart upwardly and rearwardly inclined blow pipes 58 located adjacent the front of the pile of sheets 22 near the top thereof. Each blow pipe 58 is formed at the upper end thereof with a rectangular shaped conduit 59 (Figs. 3 and 4) which extends vertically and parallel with the front side of the pile of sheets 22, and with an upwardly and forwardly curved rectangular shaped conduit or nozzle 60 that is open at the forward end and projects over the feed roller 45. As shown in Figs. 3 and 4 of the drawings, the conduit or nozzle 60 is smaller in cross section than the conduit 59 in order to provide a horizontal opening 61 in the latter and a free passage for the air discharged from said conduit through said opening. A reenforcing plate 62 is welded or otherwise suitably secured to the conduits 59 and 60 at one side thereof to prevent accidental bending of the conduit 60. It is to be noted that the vertically extending conduits 59 form rectilinear extensions of the pile guides 23, and that the curved conduits or nozzles 60 bridge the space between the pile of sheets 22 and the feed roller 45.

The blow pipes 58 are secured for vertical adjustment in clamps 63 which, in turn, are secured by bolts 64 to brackets 65. The brackets 65 are adjustably secured, as by thumb screws 66, to a cross shaft 67 which is fixed in the front heads 7. Air under pressure is continuously supplied to the blow pipes 58 by the pump 29 and for this purpose, the lower ends of said blow pipes have connected therewith corresponding ends of flexible conduits 68 the opposite ends of which are connected with a transversely extending conduit 69 that is closed at one end and connected at the opposite end with the air side of the pump 29. The conduit 69 is supported in the free ends of arms 70 which are secured to a cross shaft 71 that is fixed in the front heads 7.

It will thus appear that as each sheet is forwarded from the pile by the suction devices 35 and prior to delivery of the sheet thereby between the rollers 45 and 46 under and in lapped relation with a preceding sheet or sheets, the front edge thereof is floated and straightened against the forwardly moving overlying lapped sheet or sheets by the upwardly directed currents of air discharged from the conduits 59 through the openings 61. The front edge of the sheet is thus prevented from "fouling" on the roller 45

and proper delivery of the sheet between said roller and the rollers **46** is thus insured. It will further appear that the front edge of the sheet passing between the rollers **45** and **46** is maintained raised and straightened by the forwardly directed currents of air discharged from the conduits or nozzles **60**. The front of the sheet is thus prevented from "fouling" on the rear edges of the fingers **49** when advanced thereover by said rollers. After the front edge of the sheet is advanced over the rear edges of the fingers **49** by the rollers **45** and **46** and beyond the range of the air currents discharged from the nozzles **60** said edge is thereafter held flat and straight by the forwardly moving overlying lapped sheets on the conveyor tapes **51**.

To further insure against "fouling" of the front edges of the sheets on the rear edges of the fingers **49**, tongues **72**, welded or otherwise suitably secured to the undersides of the nozzles **60**, project over the feed roller **45** and beyond the rear edges of the fingers **49**.

The present invention has been herein described and illustrated with more or less particularity in connection with the embodiment shown and comprising a stream feeder. It is to be expressly understood, however, that the present invention is not limited to the particular embodiment thereof herein illustrated and described or otherwise than by the terms of the appended claims.

What I claim is:

1. In a sheet feeder, the combination with means for conveying a stream of lapped sheets toward a machine to be fed and suction means for forwarding sheets one after another from the rear of a pile or supply thereof and delivering them in lapped relation to said conveying means, of means adjacent the top and front of the pile or supply for directing currents of air under pressure upwardly against the sheets and for directing other and separate currents of air under pressure forwardly under said sheets and in their direction of travel, whereby the front edge portion of each forwardly moving sheet is raised and straightened to insure proper delivery of the sheet to said conveying means.

2. In a sheet feeder, the combination with suction means for forwarding sheets in lapped relation one after another from the rear of a pile or supply of sheets and conveying means for advancing a stream of the lapped sheets toward a machine to be fed, of a plurality of transversely spaced hollow members arranged between the pile or supply and the conveying means and over which the sheets are forwarded by the suction means, and means for directing currents of air under pressure upwardly against the sheets through said hollow members and for directing other and separate currents of air under pressure forwardly through the hollow members under said sheets and in their direction of travel, whereby the front edge portion of each sheet is floated and straightened against the overlying sheet or sheets and thereby properly delivered to said conveying means.

3. In a sheet feeder, the combination with suction means for forwarding sheets one after another from the rear of a pile or supply thereof, a driven feed roller and pressure rollers cooperating therewith between which the sheets are forwarded by said suction means, and a driven endless conveyor onto which the sheets are advanced by said feed and pressure rollers, of means for delivering currents of air under pressure upwardly beneath the front edge portion of each sheet while it is being forwarded by the suction means to insure proper delivery of the front edge portion of the sheet between the feed and pressure rollers, and means for delivering other and separate currents of air under pressure forwardly beneath the front edge portion of each sheet while it is being advanced by the feed and pressure rollers to insure proper delivery of said front edge portion upon the endless conveyor.

4. In a sheet feeder, the combination with suction devices for forwarding sheets one after another from the rear of a pile or supply of sheets, a driven feed roller and pressure rollers cooperating therewith and between which the sheets are forwarded by said suction devices, and a driven endless conveyor onto which the sheets are advanced by said feed and pressure rollers, of a plurality of transversely spaced hollow members arranged between the pile or supply and the feed roller and over which the sheets are forwarded by the suction devices, and means for delivering air under pressure through the hollow members in a vertical direction and beneath the front edge portion of each sheet while it is being advanced by the suction devices to insure proper delivery of the front edge portion of the sheet between the feed and pressure rollers and for delivering air under pressure through said hollow members in a forward direction beneath the front edge portion of each sheet while it is being advanced by the feed and pressure rollers to insure proper delivery of said front edge upon the endless conveyor.

5. In a sheet feeder, the combination with a support for a pile of sheets, front pile guides for guiding the pile of sheets during upward movement thereof on the support, means for forwarding sheets one after another from the top and rear of said pile of sheets, and means for conveying the forwarded sheets toward a machine to be fed, of sheet guiding means arranged adjacent the front and top of the pile between the latter and the conveying means and comprising a plurality of transversely spaced hollow members having upwardly extending portions forming rectilinear extensions of said pile guides and having forwardly curved portions forming a bridge between the pile and the conveying means, and means for delivering air under pressure through the upwardly extending and forwardly curved portions of said hollow members and beneath the front edge portion of each sheet whereby said edge portion is raised to insure proper delivery thereof to said conveying means.

6. In a sheet feeder, the combination with sheet forwarding means arranged at the rear of a pile or supply of sheets and adapted to forward sheets one after another from said pile or supply and a continuously driven conveyor for conveying the forwarded sheets toward a machine to be fed, of means arranged adjacent the front of the supply between the latter and the conveyor and adapted to raise the front edge portion of each forwardly moving sheet to insure proper delivery thereof to said conveyor, said last named means comprising a plurality of transversely spaced tubular members each having an upwardly extending hollow portion rectangular in cross section and provided with an opening therein and a forwardly curved hollow portion rectangular in cross section and open at the forward end thereof, and means for delivering air under pressure in a vertical di-

rection through the opening in said upwardly extending portion and in a forward direction through the open end of said forwardly curved portion.

7. In a sheet feeder, the combination with suction devices for forwarding sheets one after another from the rear of a pile or supply of sheets, a driven feed roller and pressure rollers cooperating therewith and between which the sheets are forwarded by said suction devices, a driven endless conveyor forwardly spaced from said feed and pressure rollers, and a sheet support between the feed roller and the conveyor, of means arranged adjacent the front of the supply between the latter and said feed roller for guiding the front edge of each forwarded sheet between the feed and pressure rollers and over the sheet support, said means comprising a plurality of transversely spaced hollow members having upwardly extending straight portions and forwardly extending curved portions, tongues on the forwardly extending curved portions and projecting over said feed roller and said sheet support, and pump means for delivering air under pressure through said hollow members in upward and forward directions.

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