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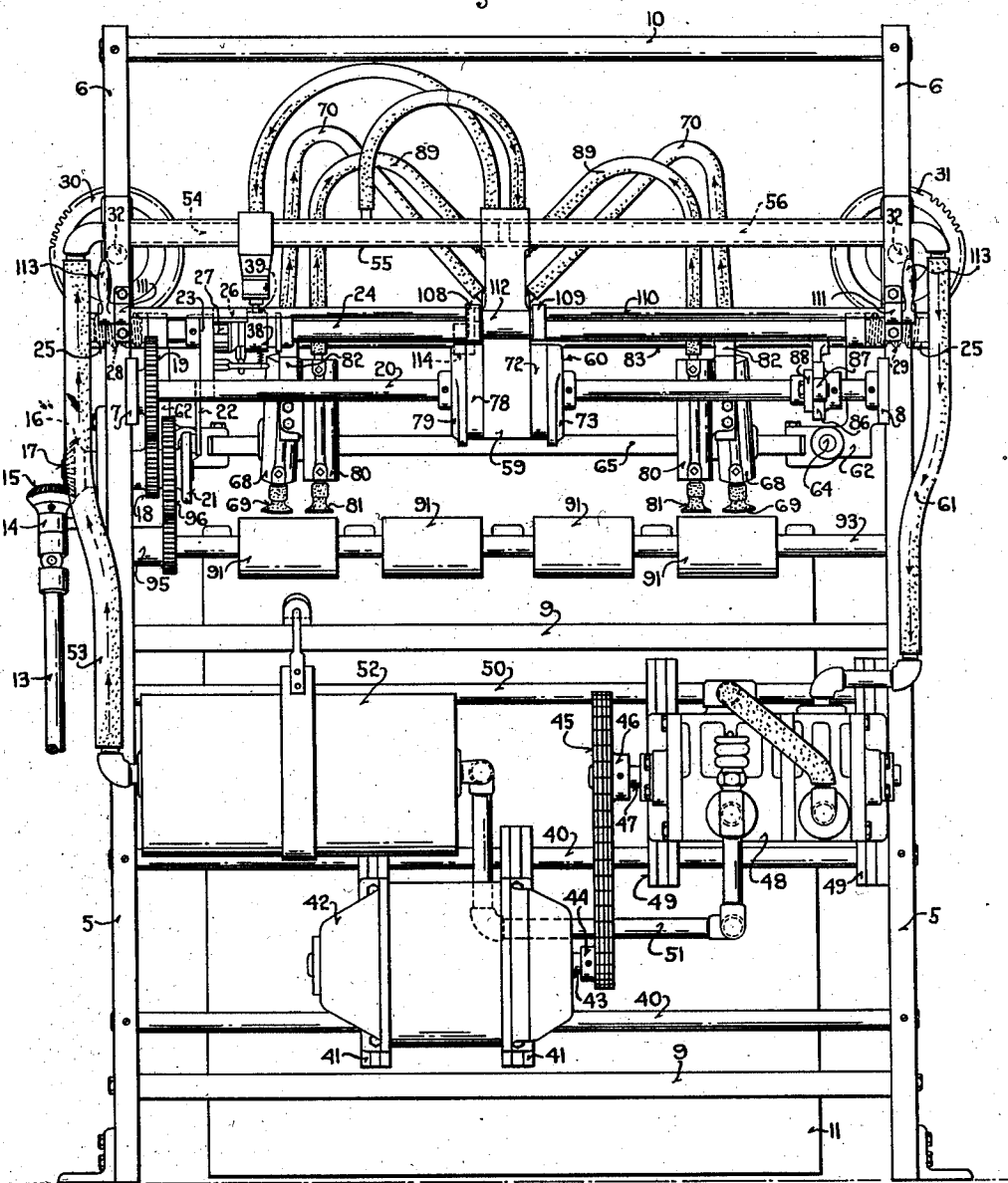
2,168,559

SHEET FEEDING APPARATUS

Filed April 27, 1938

2 Sheets-Sheet 1

Fig. 1



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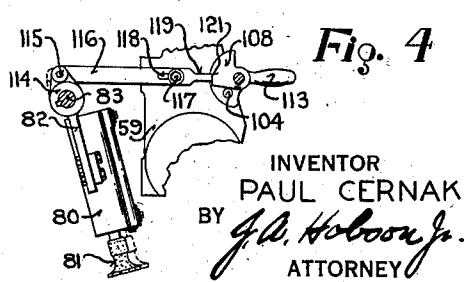
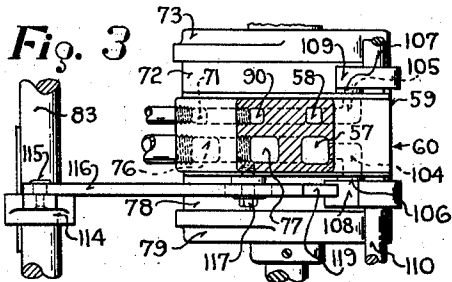
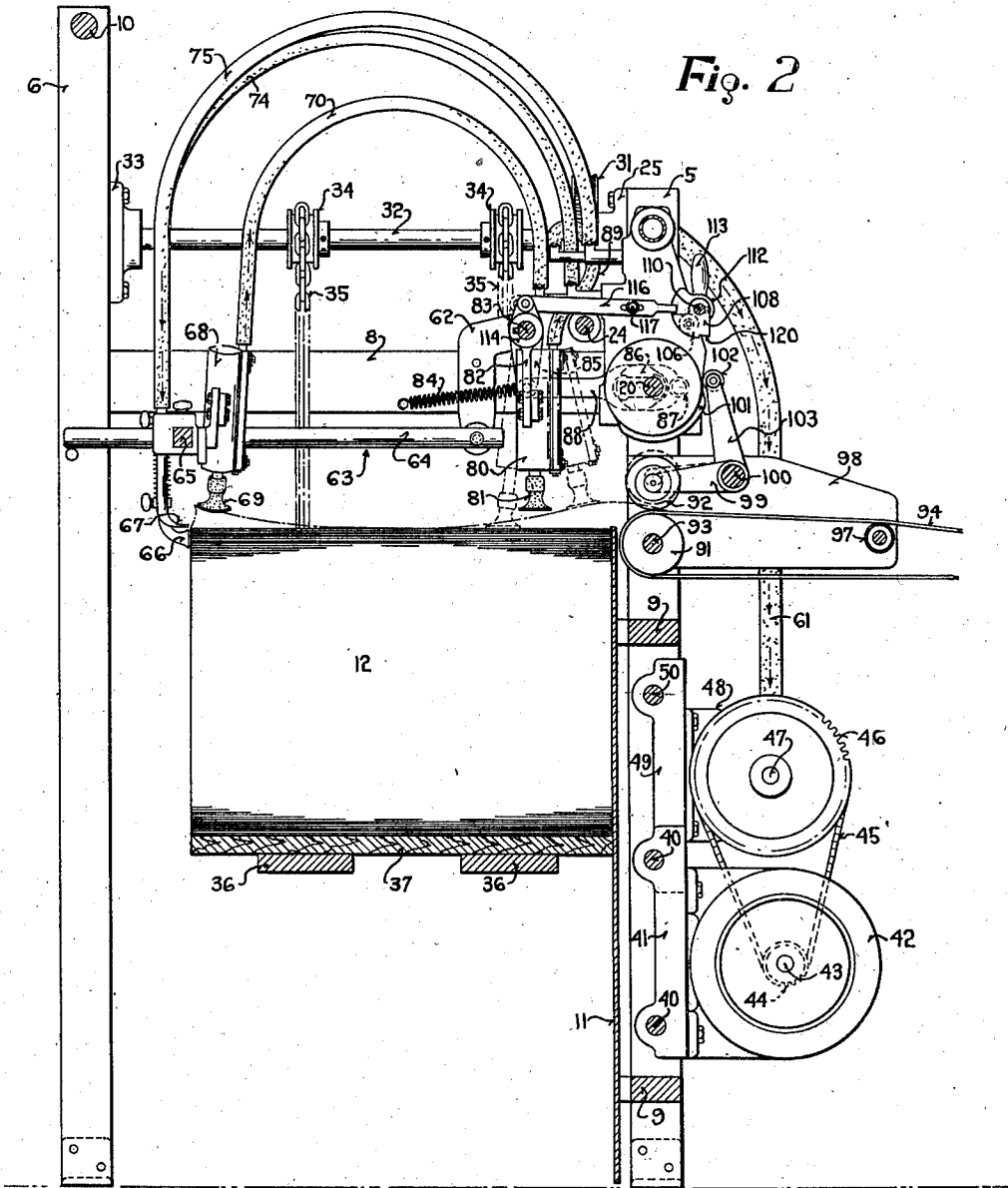
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2 Sheets-Sheet 2



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SHEET FEEDING APPARATUS

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Application April 27, 1938, Serial No. 204,521

14 Claims. (Cl. 271—56)

This invention relates to sheet feeders and while capable of general use is more particularly adapted for embodiment in feeders for feeding sheets of tin, black iron, aluminum and the like to printing presses, punch presses, coating and varnishing machines, and various other instrumentalities employed in the processing or making of metal articles or containers.

One object of the present invention is to provide an improved feeder which through the provision of novel, simple and inexpensive means can be stopped and started without disturbing the proper timed relation of the sheet feeding parts.

Another object of the present invention is to provide an improved feeder having novel means for automatically controlling the starting and stopping of the sheet feeding operation so that proper timed relation is always maintained between the feeder and the machine or other instrumentality with which it is associated.

Another object of the present invention is to provide an improved feeder having novel means for preventing stopping of the sheet feeding operation until the completion of feed of any sheet in process of being fed from the sheet supply on said feeder.

Another object of the present invention is to provide an improved feeder having novel means for locking the sheet feeding elements when feeding of sheets thereby is interrupted.

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 front elevation of a feeder embodying the present invention and particularly adapted for feeding metal sheets;

Fig. 2 is a vertical longitudinal sectional view of the feeder shown in Fig. 1;

Fig. 3 is an enlarged top plan view, partly in section, of the feeder starting and stopping device and control means therefor shown in Figs. 1 and 2;

Fig. 4 is a side elevation, partly in section, illustrating the position of the feeder starting and stopping device and the sheet forwarding devices when the feeder is stopped.

Referring to the drawings, wherein like reference characters designate like parts throughout the several views, the various movable parts of the feeder as well as certain stationary parts

thereof may be mounted on a frame of any suitable construction and the movable parts employed during normal operation of the feeder may be actuated or driven by any suitable means. As hereinafter shown, said frame and driving means are preferably constructed as follows.

The feeder frame is comprised by front uprights 5 and rear uprights 6 connected together by side members 7 and 8 (Figs. 1 and 2). The uprights 5 and 6 are bolted or otherwise suitably secured to the machine foundation, the front uprights 5 being connected together by cross members 9 bolted or otherwise suitably secured thereto, and the rear uprights 6 being connected together at the tops thereof by a stay shaft 10. The cross members 9 have bolted or otherwise suitably secured thereto a metal apron or plate 11 against which the front side of a supply or pile of metal or other sheets 12 bears during elevation of the same by mechanism to be hereinafter described.

Referring now more particularly to Fig. 1, the drive for the feeder is preferably comprised by an inclined driven jack shaft 13 which, in turn, is driven from any suitable source of power (not shown). The upper end of this jack shaft 13 is journaled in a suitable bearing provided by a bracket 14 that is bolted or otherwise suitably secured on one of the front uprights 5.

Fixed on the upper end of jack shaft 13 is a bevel gear 15 which meshes with a similar gear 16 fixed on a short shaft 17 journaled in suitable bearings in the bracket 14 and the adjacent front upright 5. Fixed on the short shaft 17 is a spur pinion 18 which meshes with a spur gear 19 that is fixed on a cam shaft 20. This cam shaft 20 is journaled in suitable bearings in the front uprights 5 and is utilized to operate various parts of the feeder to be hereinafter described. The feeder includes a pile elevator and operating mechanism therefor preferably constructed as follows.

The short shaft 17 has fixed thereon a crank disk 21 pivotally connected with one end of a link 22 the opposite end of which is pivotally connected with a pawl carrier 23 that is loosely mounted on a shaft 24 (Fig. 1). This shaft 24 extends transversely of the feeder and is journaled in suitable bearings in brackets 25 (Figs. 1 and 2) that are bolted or otherwise suitably secured to the front uprights 5 at the upper ends thereof. Shaft 24 is operated at suitable intervals to raise the pile elevator hereinafter described and said operation of said shaft is preferably effected by pawl and ratchet mechanism of the general type

disclosed in the application Serial No. 33,002 of Leonard Baker filed July 25, 1935.

This pawl and ratchet mechanism includes the pawl carrier 23 and a pawl 26 pivoted thereon and adapted, under certain conditions, to engage a ratchet 27 fixed on the shaft 24. It will thus appear that through oscillation of the pawl carrier 23 by the described driving connections therefor with jack shaft 13 and through engagement of the oscillating pawl 26 with the ratchet 27, the shaft 24 will be intermittently rotated. Under these conditions right and left hand worms 28 and 29 fixed on shaft 24 will likewise be rotated. These worms 28 and 29 mesh with right and left hand worm gears 30 and 31 fixed on shafts 32 that are journaled in suitable bearings in the brackets 25 and in brackets 33 which are bolted or otherwise suitably secured to the rear uprights 6 (Fig. 2).

Fixed on shafts 32 are toothed sheaves 34 in the teeth of which are engaged links of chains 35 so that when the shafts 32 are rotated in the proper direction by the described driving means therefor, said chains will be raised and thus raise an elevator comprising cross beams 36 to which the lower ends of said chains 35 are secured in any suitable manner. The elevator 36 has placed thereon a pile board 37 which, together with the pile of metal or other sheets 12, is positioned on said elevator through the rear of the feeder when the elevator is lowered.

The elevator 36 and pile of sheets 12 thereon are raised intermittently as the sheets are fed off the top of the pile by sheet separating and forwarding devices hereinafter described, and to keep the top of said pile at a predetermined level for the operation of said devices the elevator and its operating mechanism are preferably controlled by pneumatic means including a mask 38 and a mask detent 39 (Fig. 1) preferably mounted, constructed and operated as disclosed in the application Serial No. 116,692 of Leonard Baker, George A. Martin, and Leo C. Williams, filed December 19, 1936 and needing no detail description herein.

The feeder embodies means for supplying compressed air to pile and sheet winding devices, and means for creating vacuum in the sheet separating and forwarding devices, and said means are preferably mounted, constructed and operated as follows: Extending across the feeder frame and secured in any suitable manner to the front uprights 5 thereof are cross shafts 40 (Figs. 1 and 2). These cross shafts 40 have bolted or otherwise suitably secured thereto brackets 41 which, in turn, have bolted or otherwise suitably secured thereto an electric motor 42. Fixed on the armature shaft 43 of motor 42 is a sprocket 44 around which passes a chain 45 that also passes around a sprocket 46 that is fixed on the shaft 47 of a pump 48 suitably constructed to supply air under pressure from one part thereof and to create vacuum in another part thereof.

This air and vacuum pump 48 is bolted or otherwise suitably secured above, and to one side of, the motor 42 on brackets 49 which, in turn, are bolted or otherwise suitably secured on one of the cross shafts 40 and a third cross shaft 50 located thereabove and secured in any suitable manner on the front uprights 5. Connected with the exhaust or air pressure side or part of pump 48 is one end of a conduit 51 the opposite end of which is connected with a compressed air tank 52 secured in any suitable manner on the feeder frame above and to one side of the motor 42.

The compressed air tank 52 has connected therewith one end of a conduit 53 the opposite end of which is connected with one part 54 of a tubular shaft indicated broadly at 55. This tubular shaft 55 is divided centrally in any suitable manner and the other part of said shaft is indicated at 56. Part 54 provides an air supply conduit and part 56 provides a vacuum conduit and both of these parts are connected with conduits 57 and 58 (Fig. 3) respectively, formed in the housing 59 of a valve mechanism 60 supported on the feeder in any suitable manner and through which the cam shaft 20 extends. The construction and operation of this valve mechanism is the same as that of the valve mechanism disclosed in application Serial No. 116,692 above referred to and needs no further detail description herein. The vacuum part or conduit 56 of tubular shaft 55 has connected therewith one end of a conduit 61 the opposite end of which is connected with the vacuum side or part of pump 48. The valve mechanism 60, through the described connections therefor with the pump 48, controls the delivery of air under pressure to pile and sheet winding devices, and the making and breaking of vacuum in sheet separating and forwarding devices hereinafter referred to.

Bolted or otherwise suitably secured on the side members 7 and 8 are brackets 62 to which is pivoted an auxiliary frame 63 comprised by side members 64 and a rear cross member 65 mounted on said side members and adjustable therealong to various positions. The cross member 65 has mounted thereon, at opposite sides thereof, pile and sheet winding devices indicated at 66 and 67 respectively, and vacuum sheet separating devices comprised by cylinders 68 and suction cups 69 that are raised and lowered through the making and breaking of vacuum in said cylinders. These sheet separating devices are constructed and operated in the same manner as the sheet separating devices disclosed in application Serial No. 116,692 and need no detail description herein. It might be pointed out, however, that the cylinders 68 are connected by flexible hose 70 with a conduit 71 (Fig. 3) formed in the valve housing 59 and that the making and breaking of vacuum in the sheet separating devices at predetermined intervals is effected by the rotary valve 72 connected with the driving disk 73 that is fixed on the cam shaft 20. The rotary valve 72, during rotation of the same, connects and disconnects the conduit 71 with the conduit 58 which, as previously pointed out, is connected by the described connections with the vacuum side of pump 48. Also, the pile and sheet winding devices 66, 67 are connected by flexible hose 74 and 75 with conduits 76 and 77 (Fig. 3) respectively, formed in the valve housing 59, and delivery of compressed air to said pile and sheet winding devices at proper predetermined intervals is effected by the rotary valve 78 connected with the driving disk 79 that is fixed on the cam shaft 20. The rotary valve 78, during rotation of the same, connects and disconnects the conduits 76, 77 with the conduit 57 which, as previously pointed out, is connected by the described connections with the compressed air tank 52.

The sheet forwarding devices are comprised by cylinders 80 and suction cups 81 that are raised up and down relative to the cylinders through the making and breaking of vacuum therein. These sheet forwarding devices are also constructed and operated in the same manner as the sheet forwarding devices disclosed in application Serial 75

No. 116,692 and need no detail description herein.

It is pointed out, however, that the sheet forwarding devices have swinging movement to advance the sheets that have been separated from the

5 pile 12 by the sheet separating devices, and for this purpose cylinders 80 are secured on arms 82 which, in turn, are fixed on a rock shaft 83 that extends transversely of the feeder frame and is journaled in suitable bearings in the brackets 62.

10 The sheet forwarding devices are rocked rearwardly by a spring 84 having one end connected with an arm 85 (Fig. 2) fixed on rock shaft 83, the opposite end of said spring being connected with the side member 8 in any suitable manner. The

15 sheet forwarding devices are rocked forwardly by a cam 86 fixed on and rotated by cam shaft 20. This cam 86 engages a cam roller 87 journaled on a cam strap 88 extending over cam shaft 20 and connected with the arm 85.

20 The making and breaking of vacuum in the cylinders 80 is also effected by the valve 72 at proper intervals, and for this purpose the cylinders 80 are connected by flexible hose 89 with a conduit 90 (Fig. 3) formed in the valve housing 59 and which, through rotation of the valve 72, is

25 connected and disconnected with the conduit 58. It might be pointed out, however, that the operation of the valve 72 is so timed that vacuum is established in the cylinders 80 to move the suction cups 81 into engagement with the top sheet of the pile when the sheet forwarding devices have been swung rearwardly, as illustrated in dotted lines in Fig. 2, and is maintained therein until said devices have completed their forward

30 movement and delivered the sheet engaged thereby in proper position on a conveyor hereinafter described.

The sheets separated from the pile 12 by the sheet separating devices are taken by the sheet forwarding devices and delivered thereby to a sheet conveyor that advances the sheets to the machine with which the feeder is associated. As herein shown, this conveyor includes feed and drop rollers 91 and 92 respectively. The feed rollers 91

45 are fixed in spaced relation on a shaft 93 extending transversely of the feeder and journaled in suitable bearings on the front uprights 5. The shaft 93, the feed rollers 91 fixed thereon, and conveyor tapes 94 passing around said rollers are driven by suitable gearing including a gear 95

50 fixed on said shaft, and a gear 96 which meshes with the gear 95 and is fixed on and rotated by the short shaft 17. The front portions of tapes 94 pass around other rollers (not shown) and said tapes travel over a roller 97 that extends transversely of the feeder and is journaled in suitable bearings in side plates 98 which are bolted or otherwise suitably secured to the front uprights 5.

The drop rollers 92 are journaled on arms 99 fixed on a rock shaft 100 which extends transversely of the feeder and is journaled in suitable bearings in the side plates 98. The drop rollers 92 are raised and lowered by a cam 101 secured to or formed integrally with the valve driving disk

65 79 and which engages a roller 102 journaled on an arm 103 that is fixed on the rock shaft 100.

In accordance with the present invention means are provided for temporarily interrupting the feed of sheets from the top of the pile whenever this is

70 necessary or desirable, without having to disconnect the feeder from its source of power; without having to provide the usual and generally expensive clutch mechanism therebetween; without disturbing the timing between the feeder and the

75 machine being fed thereby; and without failure of

completion of feed of a sheet in process of delivery from the feeder when the sheet feeding operation is interrupted. As herein shown said means is preferably constructed and operated as follows.

The valve housing 59 is provided at opposite sides thereof with ports 104, 105 (Fig. 3) communicating with the conduits 57 and 58 respectively and opening outwardly through said sides of said housing. Normally, these ports 104, 105 are closed by small disc valves 106 and 107 (Figs. 2 and 3) mounted on arms 108 and 109 disposed at opposite sides of the valve housing 59 and fixed on a rock shaft 110. This rock shaft 110 extends transversely of the machine and is journaled in suitable bearings in brackets 111 (Fig. 1) bolted or otherwise suitably secured on the front uprights 5 and in a lug 112 formed on the valve housing 59. The rock shaft 110 has fixed on the ends thereof handles 113 and by turning either of these handles in one direction the shaft 110, arms 108, 109, and disc valves 106, 107 may be swung to uncover the ports 104, 105 thus opening the conduits 57, 58 to atmosphere and preventing the operation of the sheet separating devices, the sheet forwarding devices and the pile and sheet winding devices. Obviously when the rock shaft 110 is swung in the opposite direction by either of the handles 113, the disc valves 106, 107 will cover the ports 104, 105 so that the sheet separating, forwarding and winding devices may be operated as above described.

Keyed or otherwise suitably secured to the rock shaft 83 is an arm 114 (Figs. 2 to 4 inclusive) having pivotally connected therewith as at 115 one end of a latch bar 116. Latch bar 116 is guided for reciprocating movement on a stud 117 which is threaded into the side of the valve housing 59 and extends through a slot 118 formed in said latch bar. The opposite end of latch bar 116 is formed with a nose 119 which, during normal operation of the feeder and for a major portion of each cycle thereof, projects over and into the path of movement of the arm 108 on the rock shaft 110, as illustrated in Figs. 2 and 3, and thereby prevents actuation of the shaft 110, arms 108, 109 and disc valves 106, 107 to interrupt the feeding of sheets from the top of the pile. However, when the sheet forwarding devices are swung to their extreme forward position, as shown in dotted lines in Fig. 2, through engagement of the roller 87 with the highest point on the cam 86, to deliver the sheet engaged thereby in proper position between the feed and drop rollers 91 and 92, the arm 114 and latch bar 116 are moved in the opposite direction to retract the nose 119 out of the path of the arm 108 at which time the shaft 110, arms 108, 109 and disc valves 106, 107 may be actuated to interrupt the feeding of sheets from the top of the pile. It will thus appear that the feeding of sheets from the top of the pile cannot be interrupted while a sheet is engaged by the sheet forwarding devices and before it is delivered in proper position thereby on the conveyor.

When the arms 108, 109 and disc valves 106, 107 thereon are actuated to interrupt the feeding of sheets from the top of the pile, the nose 119 of latch bar 116 engages a notch 120 (Figs. 2 and 4) formed in the arm 108 and terminating in a shoulder 121. Engagement of the nose 119 with the notch 120 and shoulder 121 prevents rearward movement of the sheet forwarding devices under the action of the spring 84 upon continued rotation of the cam 86, and also locks the arms 108, 75

109 and shaft 110 as illustrated in full line position in Fig. 4, against movement in the opposite direction to start or restart the feeding operation except at the proper time as hereinafter described.

When it is desired to resume feeding operation, actuation of the arms 108, 109 and disc valves 106, 107 thereon is only possible when the sheet forwarding devices are moved slightly forward, as indicated in dotted lines in Fig. 4 by the high part of cam 86 to retract the arm 114 and latch bar 116 and thus disengage the nose 119 from the notch 120 and shoulder 121 on the arm 108, at which time the ports 104, 105 are again covered and the sheet forwarding devices move rearwardly at the proper time under the action of the spring 84 upon continued rotation of cam 86 and into proper position to act on the next sheet of the pile. It will thus appear that through the previously described control for the arms 108, 109 and disc valves 106, 107 thereon, actuation of said arms and valves to start or stop the feeding of sheets is only possible at the same predetermined point in each operating cycle of the feeder thus always maintaining the proper timed relation between said feeder and the machine with which it is associated.

The operation of a feeder constructed in accordance with the present invention will be clearly understood from the foregoing description and while said description and the accompanying drawings set forth with more or less particularity one embodiment of the invention, it is to be expressly understood that said invention is not limited to said embodiment or otherwise than by the terms of the appended claims.

What I claim is:

1. In a sheet feeder, suction sheet feeding means, mechanism for imparting motion thereto including a driven element and driving connections therefor with the suction sheet feeding means enabling motion thereof to be discontinued while driving of said element continues, and means for discontinuing the sheet feeding action of the sheet feeding means while driving of said element continues comprising a valve for opening the sheet feeding means to atmosphere and means for preventing opening operation of said valve unless said sheet feeding means has been moved to a predetermined position by said mechanism.

2. In a sheet feeder, the combination with a sheet conveyor and a suction device for forwarding sheets to said conveyor, of mechanism for reciprocating the suction sheet forwarding device including a driven element and connections therefor with the suction sheet forwarding device enabling sheet forwarding action thereof to be discontinued while driving of said element continues, and means for discontinuing the sheet forwarding action of the suction sheet forwarding device while driving of said element continues comprising a valve for opening the suction sheet forwarding device to atmosphere and means for preventing opening operation of said valve unless said mechanism has moved said suction sheet forwarding device to its sheet delivery position with respect to said conveyor.

3. In a sheet feeder, suction sheet feeding means, mechanism for imparting motion thereto including a driven element and connections therefor with the suction sheet feeding means enabling sheet feeding action thereof to be discontinued while driving of said element continues, a valve for opening the sheet feeding means

to atmosphere when said sheet feeding means is moved by said mechanism to a predetermined position, and means for preventing movement of the sheet feeding means when said valve is opened and while driving of said element continues.

4. In a sheet feeder, suction sheet feeding means, mechanism for imparting motion thereto including a driven element and connections therefor with the suction sheet feeding means enabling sheet feeding action thereof to be discontinued while driving of said element continues, and means for discontinuing the sheet feeding action of the sheet feeding means when the latter is in a predetermined position comprising valve means and holding means intermittently engaged during feeding action of the feeder and operable when disengaged to open the sheet feeding means to atmosphere and to hold said sheet feeding means against movement while driving of said element continues.

5. In a sheet feeder, suction sheet forwarding means, mechanism for imparting motion thereto including a driven element and connections therefor with the suction sheet forwarding means enabling sheet forwarding action thereof to be discontinued while driving of said element continues, and means for discontinuing the sheet forwarding action of the sheet forwarding means when the latter is in sheet delivery position comprising valve means and forwarder actuated holding means intermittently engaged during normal operation of the feeder and operable when disengaged to open the suction sheet forwarding means to atmosphere and to hold said sheet forwarding means against movement in said position while driving of said element continues.

6. In a sheet feeder, suction sheet feeding means, mechanism for reciprocating the same, advancing and retracting means connected with the suction sheet feeding means and retracted when the latter is advanced, and means operable when the advancing and retracting means is retracted for stopping the sheet feeding means in advanced position and opening said sheet feeding means to atmosphere.

7. In a sheet feeder, a sheet feeding device, mechanism for reciprocating the same, means for preventing reciprocation of the sheet feeding device, and means for preventing operation of said first named means unless said sheet feeding device is in a predetermined position.

8. In a sheet feeder, a sheet feeding device, mechanism for imparting motion thereto, a device connected with the sheet feeding device and movable to stopping and non-stopping positions therefor, and means operable when the second named device is in its stopping position to hold said second named device and said sheet feeding device against movement and thereafter release them for movement by said mechanism.

9. In a sheet feeder, a suction sheet feeding device, mechanism for imparting motion thereto, a member connected with the sheet feeding device and movable to stopping and non-stopping positions therefor, and valve means operable when the member is in its stopping position to open the sheet feeding device to atmosphere, hold the member and sheet feeding device against movement, and thereafter release said member and device for movement thereof by said mechanism.

10. In a sheet feeder, a reciprocating sheet feeding device, a reciprocating member connected therewith, a rotatable element provided with

a notch, mechanism for reciprocating said device and member so that the latter moves into and out of the path of movement of said element, and means operable when the reciprocating member is moved out of the path of movement of said element for rotating the element, engaging the end of the member in said notch, and stopping the movement of said member and said device.

11. In a sheet feeder, suction sheet feeding means, valve mechanism for automatically making and breaking vacuum in said suction sheet feeding means at predetermined intervals, manually operated means for opening and closing the valve mechanism to atmosphere to stop and start the sheet feeding action of the suction sheet feeding means, and timed stop means for preventing actuation of said manually operated valve opening and closing means while vacuum is created in the suction sheet feeding means and a sheet is being fed thereby.

12. In a sheet feeder, suction sheet feeding means, valve mechanism for automatically making and breaking vacuum in said suction sheet feeding means at predetermined intervals, manually operated means for opening and closing the valve mechanism to atmosphere to stop and start the sheet feeding action of the suction sheet feeding means, and stop means controlled by the suction sheet feeding means and movable into the

path of said manually operated means for preventing actuation thereof while vacuum is created in the suction sheet feeding means and a sheet is being fed thereby.

13. In a sheet feeder, a suction sheet forwarding device, mechanism for automatically making and breaking vacuum in said suction sheet forwarding device at predetermined intervals, a manually operated valve for opening and closing said mechanism to atmosphere to stop and start the sheet feeding action of said suction sheet forwarding device, and stop means automatically movable into and out of the path of movement of said manually operated valve for preventing actuation thereof except at a predetermined time in each operating cycle of the feeder.

14. In a sheet feeder, suction sheet feeding means, valve mechanism for automatically making and breaking vacuum in said suction sheet feeding means once in each cycle of operation of said feeder, means for opening and closing the valve mechanism to atmosphere to stop and start the sheet feeding action of the suction sheet feeding means, and timed stop means for controlling the actuation of said valve opening and closing means in timed relation with the operation of said valve mechanism.

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