

May 23, 1939.

G. SPIESS

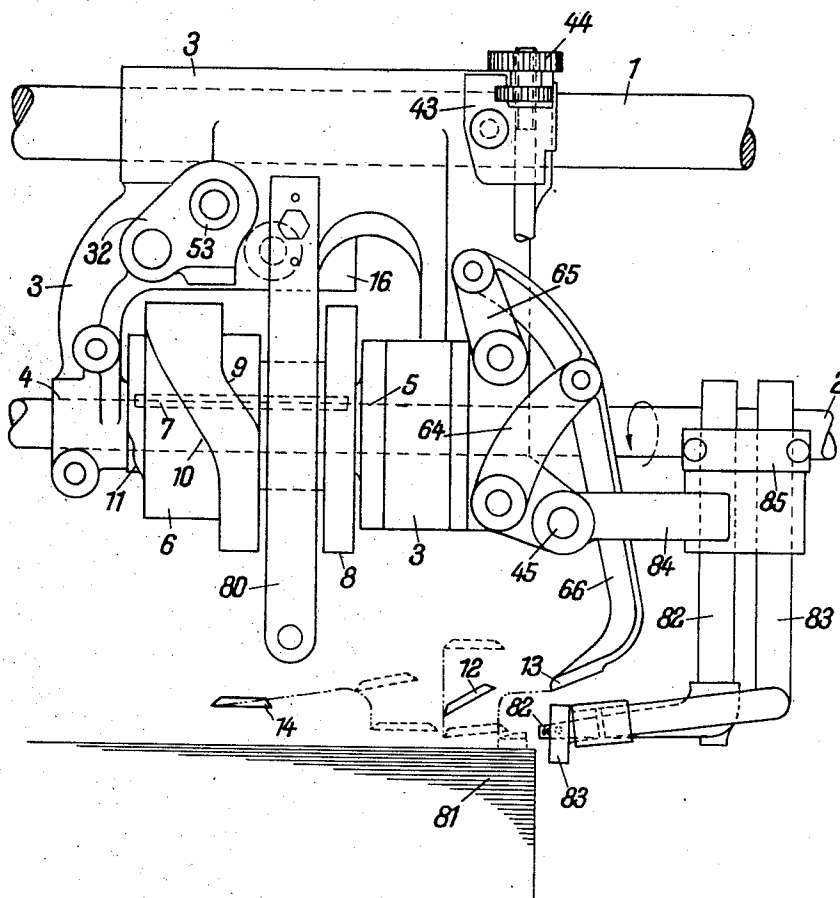
2,159,456

AUTOMATIC SHEET FEEDING DEVICE

Filed Dec. 17, 1937

3 Sheets-Sheet 1

Fig. 1



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3 Sheets-Sheet 2

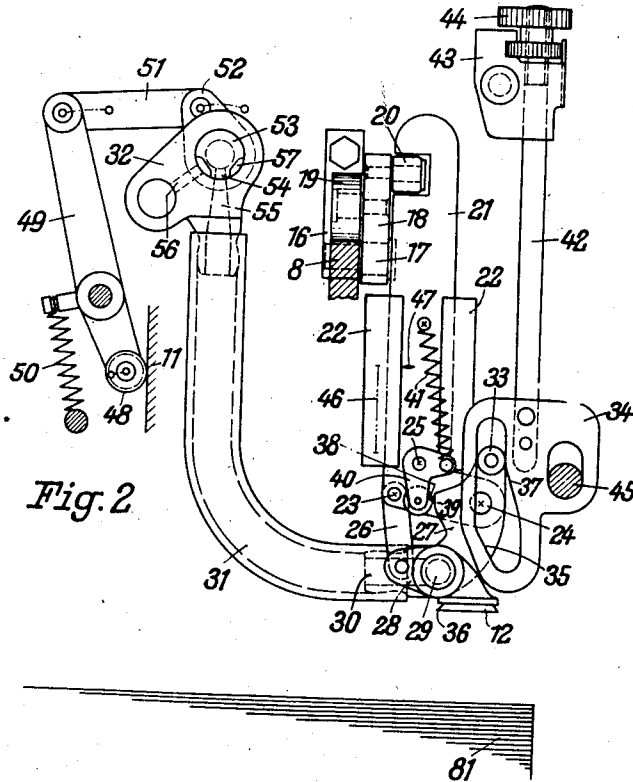


Fig. 2

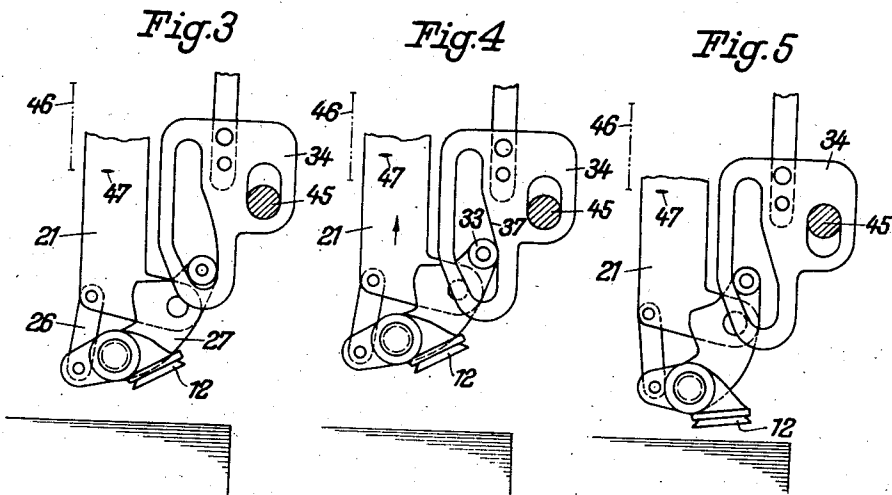


Fig. 3

Fig. 4

Fig. 5

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3 Sheets-Sheet 3

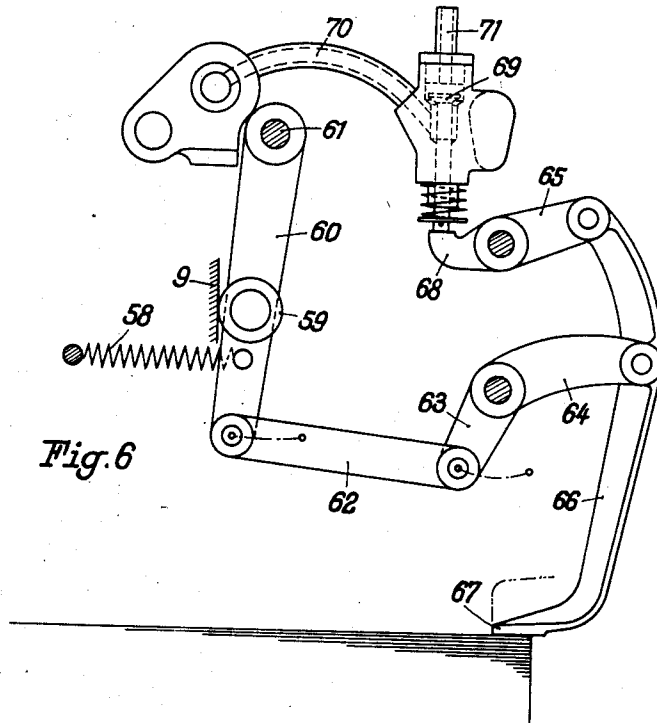


Fig. 6

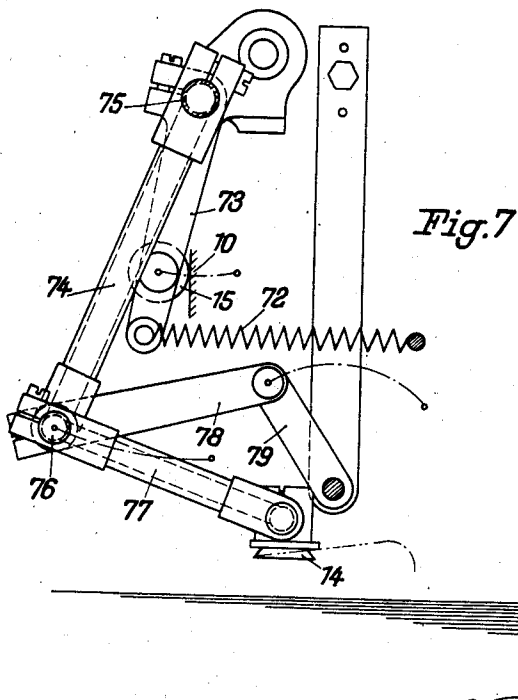


Fig. 7

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UNITED STATES PATENT OFFICE

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AUTOMATIC SHEET FEEDING DEVICE

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12 Claims. (Cl. 271-27)

This invention relates to an automatic sheet feeding device comprising sheet separating and feeding means engaging the rear edge of the pile and being adjustable on a driving shaft which extends above the pile in the direction of the sheet travel.

In the known types of sheet feeders of this class the parts cooperating in the separation and feeding of the sheets, such as the suction nozzles for separating the sheets, the sheet feeding means, the pile height feeler for controlling pile feeding and also the starting and stopping means for suction and blast air, are driven by lifting cams arranged on a control shaft extending transversely to the feeding direction. This requires the provision of an intermediate gear between the control shaft adjustably disposed in the separating means and the driving shaft firmly arranged in feeding direction. A construction of this kind is quite complex and increases the height of the device above the pile besides raising the cost.

Furthermore, in the above-mentioned devices the suction nozzles are tipped by air suction which affords the advantage of relative simplicity. However, in case of greater output of the machine, tipping on which the feeding of single sheets chiefly depends cannot be effected quickly enough and easily causes service troubles due to the picking up of two sheets. Mechanical tipping does not involve this risk.

According to the invention, air control of tipping is therefore replaced by mechanical tipping control in such manner that the driving mechanism for the separating and feeding means is not enlarged thereby. This is effected by deriving the tipping control of the separating suction members from their up and down motion with the aid of a fixed cam or stop member. Adjustable arrangement of the cam member and the provision of curves make it furthermore possible to adjust the degree of tipping, to maintain the tipping position during upward motion and to abolish it toward the end of the movement.

The drawings illustrate a constructional example of a sheet feeding device according to the invention.

Figure 1 is an elevation of the separating and feeding device in which, for better comprehension, the mechanism for moving the separating and feeding means is not shown or only different positions of these means are indicated.

The movement tracks of the members coming into contact with the sheets are indicated by dotted lines.

Figs. 2-7 are elevations, viewed from the same side, of the parts omitted in Fig. 1, and in fact Fig. 2 illustrates the mechanism for the separating nozzles and for the air control,

Figs. 3-5 show different positions of the separating nozzle mechanism shown in Fig. 2 and the control curve.

Fig. 6 shows the sheet holder and pile height feeler with the parts appertaining thereto, and

Fig. 7 shows the mechanism of the feeding nozzles.

On a supporting shaft 1 and a driving shaft 2 the body of the sheet separating and feeding device 3 is arranged so as to be adjustable in the direction of the sheet travel. Between the bearings 4 and 5 of the key-way shaft 2, the curved cam member 6 is guided after the manner of a fork so that an axial movement of the latter with regard to the frame 3 is prevented, whilst a key 7 causes the rotation of the cam member 6 with the shaft 2. The cam member 6 is provided with four running tracks for rollers, three of which extend in an axial direction and one in a radial direction. The radial running track 8 causes the up and down movement as also the tipping of the separating nozzles 12. The running track 9 moves the sheet holder and pile height feeler 13, and the running track 10 moves the conveying nozzles 14. The running track 11 serves for the air control. It is arranged on a smaller area than the track 10 in order to leave space for the roller 15 running on 10.

The transmission of motion from the roller tracks 8 and 11 to the nozzles 12 or to the valve respectively, can be seen from Fig. 2. On a bearing 16 arranged rigidly on the housing a roller lever 18 is pivotally mounted by means of a bolt 17. The said roller lever 18 carries the rollers 19 and 20. The roller 19 takes its movement from the running track 8; the roller 20 transmits the movement to the flat slide 21. A spring, which is not illustrated, draws the roller 19 against the running track 8. The slide 21 is guided between the frame 3 and covering bars 22. It carries at its lower end three bolts 23, 24 and 25. At 23 and 24 the levers 26 and 27 are journaled, which levers carry in common the connecting lever 28. The lever 28 is clamped rigidly or rigidly and adjustably on the suction pipe 29, which forms at the same time the link pin between levers 28 and 27. On the suction pipe 29 two or more suction nozzles 12 are fixed. Further, a hose sheath 30 is rotatably mounted on a perforated part of the pipe 29 and a flexible tube 31 provides the suction air connection

between the valve body 32 and the nozzles 12. During the up and down movement of the slide 21 a roller 33 arranged on the lever 27 is moved along the running track of a roller guide 34. As soon as the roller 33, during the downward guiding movement, reaches the inclined track 35, the lever 27 is swung around the bolt 24, and the downward movement of the nozzle 12 is thereby stopped whilst the slide 21 moves onward without hindrance. There arises in this way by a suitable choice of the lever arm a tipping movement of the lever 12 around the nozzle edge 36. The lower position of the slide 21 corresponds to the nozzle position shown in Fig. 3. During the immediately succeeding upward movement of the slide the nozzle remains in the inclined position until the roller 33 reaches the inclined track 37 and swings back the lever 27. Since the roller 33 only runs on to the roller track 34 on one side, the levers 26, 27, 28 are free to move; in order now to cut out unintended movements the link 24 is braked by the pressure of a roller 38 against the running track 39 of the lever 37. The roller 28 is arranged on a bell crank lever 40, which is pivotally connected at 25 to the slide 21, and is subjected to the pull of a spring 41 located on the slide. The running track 39 may run circularly around the point 24 but it may also be provided with stop-like recesses and, for example, as illustrated, its distance with regard to the point 24 may decrease so that by means of the roller 38 a turning moment is exercised on the lever 27 immediately the latter has left the circular part of the running track.

The roller track 34 is displaceable in the direction perpendicular to the pile surface by means of a spindle 42, which can be screwed upwards and downwards in the guide 43 fixed to the housing 3, by means of the adjusting nut 44. Meanwhile the bolt 45 rigid with the housing serves as a lower lateral guide. The effect of such a displacement of the roller guide is shown in Fig. 5. In Figs. 2-5 the total path of the slide 21 is indicated by the line 46. A mark 47 on the slide 21 shows the position of the slide at any given time. Figs. 3 and 5 thus show the same slide position but on the other hand the position of the roller track 34 is different as can be seen from the position of the bolt 45. This difference brings about the result that the roller 33 reaches the inclined track 35 later during the downward movement with the roller guide 34 in the lower position, so that the tipping movement begins lower down and is correspondingly smaller than in Fig. 3.

The tipping edge 36 of the nozzle thus lies when the tipping movement is small, nearer to the pile surface determined by the feeler 13, than when the tipping movement is large, so that by the adjustment of the nut 44 the tipping movement and the tipping plane are simultaneously adjusted.

From Fig. 2 the control of the suction air can also be seen. The roller 48 of the lever 49 runs on the roller track 11 under the action of the spring 50. By means of the pull rod 51 the lever 52 is moved, which lever is fixed on the suction air pipe 53 and during its movement consequently turns the latter in the valve 32, which is rigidly fixed on the frame 3. During this movement a slot 54 of the pipe 53 becomes connected now with the separating nozzle conduit 55, now with the feed nozzle conduit 56. Outwardly open channels 57 connect the conduit which is being separated at any given time from the suction air with the outer air.

From Fig. 6 the mechanism for moving the pile

height feeler, which serves at the same time as a sheet holder, can be seen. The roller track 9 moves, against the action of the spring 58, the lever 60 provided with the roller 59 around the fixed point 61. A press rod 62 transmits the movement to an arm 63 of the rocking arm 64 of a rectangular linkage, which is provided with a second rocking arm 65 and a coupling lever 66. On the coupling lever 66 the feeler foot 67 is arranged, which feeler member describes the path of movement shown in Fig. 6. On the rocking arm 65 an arm 68 is arranged, which controls a pile transport valve of a kind known per se. In the position shown in Fig. 6 the valve cone 69 is raised so that the suction conduit 70 comes into connection with the conduit 71 leading to the transport control, and causes an upward movement of the pile.

The feed nozzle movement is shown in Fig. 7. The roller track 10 moves the lever 73 provided with a roller 15 against the spring 72. The lever 73 and also two levers 74 formed by tubes, are clamped on a tube. In the two levers 74 a tube 76 is mounted, on which last-named tube two tube levers 77 and a guide lever 78 are clamped. The guiding of the guide lever 78 is effected by a rocking lever 79 which is pivotally mounted on a carrier 80 journaled on the frame 3. The nozzles 14 on the levers 77 may be regarded as part of a coupling which is constituted by the levers 77 and 78 and the tube 76, and represents together with the rocking arms 79 and 74 a rectangular linkage. The edge of the nozzle 14 meanwhile describes the coupling curve shown in Fig. 7.

For pre-loosening the pile 81 and for separating the sheet from the pile the blast members 83 and 82 shown in Fig. 1 serve. The said blast members are arranged in a bearing arm 84 rigid with the frame 3, in such manner that they can be deflected by movement upwards if this is necessary for any particular reason. The means for limiting downward movement is constituted by the clamping member 85 which surrounds the two blast pipes 82 and 83.

I claim:

1. An automatic sheet feeding device whose sheet separating and feeding means engage the rear edge of the pile and are adjustable along a driving shaft extending above the pile in feeding direction, comprising a driving shaft, sheet separating and feeding means, a curved cam member longitudinally displaceably yet non-rotatably mounted on the driving shaft, a pile height feeler controlling the pile transport and starting and stopping means for suction air, said separating and feeding means, feeler and starting and stopping means being controlled by said cam member.

2. A device according to claim 1, wherein suction nozzles are moved up and down in a vertical plane by the cam member to lift the rear edge of the sheets and tipping motion of the suction nozzles is derived from this motion.

3. A device according to claim 1, wherein suction nozzles are moved up and down in a vertical plane by the cam member to lift the rear edge of the sheets and tipping motion of the suction nozzles is derived from this motion, and wherein the suction nozzles are arranged on a coupling of a rectangular linkage disposed on an upwardly and downwardly moved carrier, the crank arm of said rectangular linkage being controlled by a fixed curve or a stop.

4. A device according to claim 1, wherein suction nozzles are moved up and down in a vertical plane by the cam member to lift the rear

edge of the sheets and tipping motion of the suction nozzles is derived from this motion, and wherein the suction nozzles are arranged on a coupling of a rectangular linkage disposed on an upwardly and downwardly moved carrier, the crank arm of said rectangular linkage being controlled by a fixed curve or stop, and the control curve for tipping is formed so as to maintain the tipping position during upward motion.

5. A device according to claim 1, wherein suction nozzles are moved up and down in a vertical plane by the cam member to lift the rear edge of the sheets and tipping motion of the suction nozzles is derived from this motion, and wherein the suction nozzles are arranged on a coupling of a rectangular linkage disposed on an upwardly and downwardly moved carrier, the crank arm of said rectangular linkage being controlled by a fixed curve or stop, and the control curve for tipping is formed so as to maintain the tipping position during upward motion and to return the suction member toward the end of the upward motion from tipping to initial position.

6. A device according to claim 1, wherein suction nozzles are moved up and down in a vertical plane by the cam member to lift the rear edge of the sheets and tipping motion of the suction nozzles is derived from this motion, and wherein the suction nozzles are arranged on a coupling of a rectangular linkage disposed on an upwardly and downwardly moved carrier, the crank arm of said rectangular linkage being controlled by a fixed curve or stop, and the control curve for tipping is formed so as to maintain the tipping position during upward motion and to return the suction member toward the end of the upward motion from tipping to initial position, and wherein positioning of the guide rod of the tipping rods at the control curves during up and down motion is secured by a brake which renders difficult transverse motion of the roll without preventing it.

7. A device according to claim 1, wherein the sheet feeding means comprise suction nozzles arranged on the coupling of a rectangular linkage in such manner that for feeding they successively carry out an upward motion and a motion in the direction of sheet travel.

8. A device according to claim 1, wherein a rocker arm of a rectangular linkage for control-

ling the pile height feeler controlling the sheet transport and acting also as sheet holder is moved by a curve of the cam member by means of a roller arm and thrust rod.

9. A device according to claim 1, wherein a tubular portion of the air conduit is rotatably arranged in the bearing of the device and constructed to act as control means for air control.

10. In a sheet feeding apparatus, suction nozzles movable vertically and engageable with the rear end of the upper leaf of a pile of leaves, said suction nozzles being further arranged for tipping movement, a driving shaft longitudinally disposed of the apparatus, a cam member non-rotatably mounted on said driving shaft and adjustable therealong, and an operative connection between the cam member and said nozzles whereby rotation of the cam causes vertical and tipping movements of said nozzles.

11. In a sheet feeding apparatus, suction nozzles movable vertically and engageable with the rear end of the upper leaf of a pile of leaves, said suction nozzles being further arranged for tipping movement, a driving shaft longitudinally disposed of the apparatus, a cam member non-rotatably mounted on said driving shaft and adjustable therealong, an operative connection between the cam member and said nozzles whereby rotation of the cam causes vertical and tipping movements of said nozzles, a vertically movable carrier, a rectangular linkage disposed on said carrier and supporting said nozzles, said linkage including a crank arm, and a fixed operating element in the path of said crank arm.

12. In a sheet feeding apparatus, suction nozzles movable vertically and engageable with the rear end of the upper leaf of a pile of leaves, said suction nozzles being further arranged for tipping movement, a driving shaft longitudinally disposed of the apparatus, a cam member non-rotatably mounted on said driving shaft and adjustable therealong, and an operative connection between the cam member and said nozzles whereby rotation of the cam causes vertical and tipping movements of said nozzles, said cam means being constructed and arranged to effect the tipping of said nozzles during upward movement thereof.

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