United States Patent [19]

Leiser

[11] **3,866,764**

[45] **Feb. 18, 1975**

[54] **APPARATUS FOR THE SINGLE WITHDRAWAL OF ARTICLES IN SHEET FORM FROM A STACK**

[75] Inventor: **Hermann Leiser,** Lohn, Switzerland

[73] Assignee: **Strausak AG,** Lohn, Switzerland

[22] Filed: **June 6, 1972**

[21] Appl. No.: **260,095**

[30] **Foreign Application Priority Data**

June 11, 1971 Switzerland 8493/71

[52] **U.S. Cl.** ..... **214/8.5 D,** 271/91, 271/106, 294/65

[51] **Int. Cl.** **B65g 59/04**

[58] **Field of Search** ..... 214/8.5 D, 1 BT; 294/64 R, 294/65; 271/26 E, 30 A, 31, 32, 106, 102, 91

[56] **References Cited**

UNITED STATES PATENTS

3,411,640	11/1968	Wallis	214/8.5 D
3,690,477	9/1972	Nilsson	214/8.5 D X

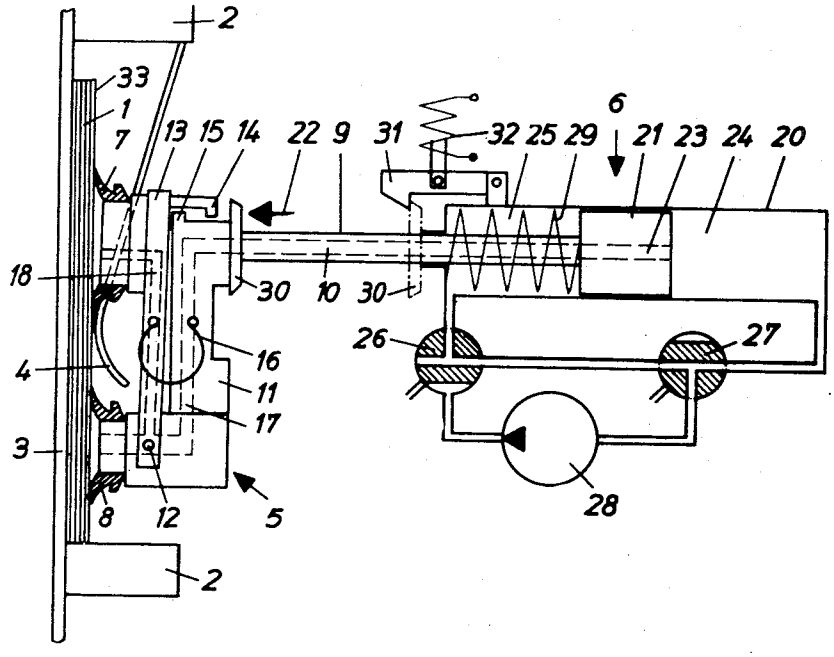
Primary Examiner—Robert J. Spar

Assistant Examiner—George F. Abraham

[57] **ABSTRACT**

This invention relates to an apparatus for the single withdrawal of articles in sheet form from a stack, especially for picture postcard vending machines, having a suction device connected to a vacuum pump and movable to and fro in the direction of the stack and a drive device for the advance and withdrawal of the suction device.

4 Claims, 5 Drawing Figures



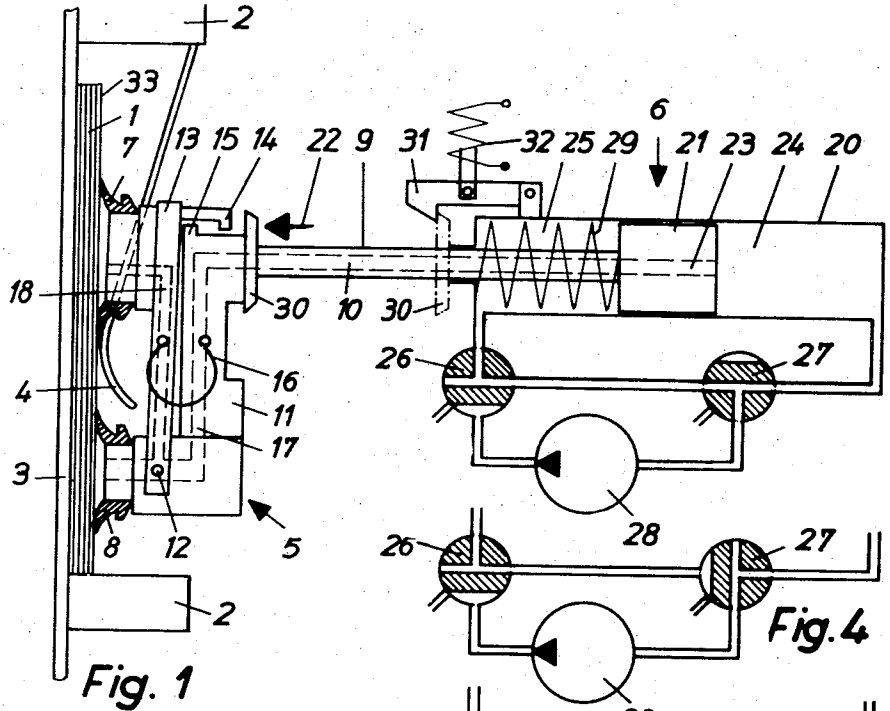


Fig. 1

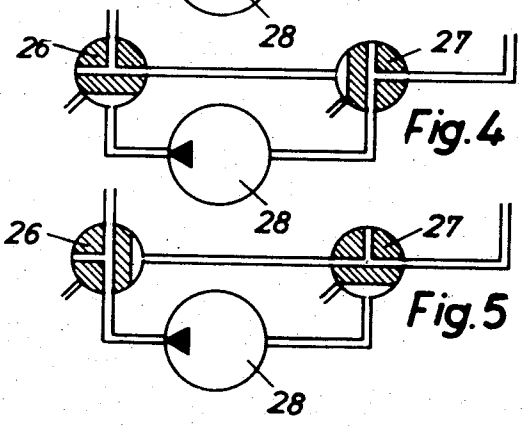


Fig. 4

Fig. 5

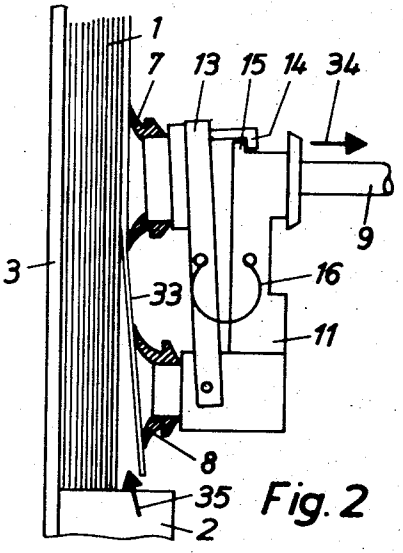


Fig. 2

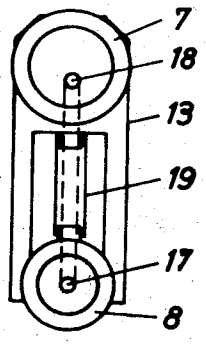


Fig. 3

APPARATUS FOR THE SINGLE WITHDRAWAL OF ARTICLES IN SHEET FORM FROM A STACK

BRIEF SUMMARY OF THE INVENTION

Known withdrawal devices of this kind possess the disadvantage that in the vertical removal of articles of sheet form from a stack, several articles are often taken at the same time. In the case of picture postcard vending machines, various inconveniences can thus occur, in that for example the cards taken in excess are also dispensed without the purchaser making payment for them, or they take a path not intended for them in the apparatus, so that operation stoppages can occur. In every case the economy of the vending machine is thereby rendered dubious.

In the case of a vertically arranged card stack in fact according to a known proposal the possibility exists of curving the card to be taken from the top of the stack, during the withdrawal movement, so that any further cards adhering to this card are detached and drop back on to the stack. Of course this solution fails in the case of any other arrangement, for example horizontal, of the card stack.

The invention has the purpose of providing a withdrawal device of the initially stated kind in which single withdrawal is guaranteed and which operates satisfactorily with the stack in any position.

The apparatus according to the invention is characterised in that the suction device comprises two suction cups which are so arranged in relation to the stack that the first suction cup comes to act in the middle part and the second suction cup comes to act on the margin of the article of sheet form to be taken in each case, and that the drive connection with the first suction cup includes an idle motion so that at the beginning of the retraction of the suction device in the withdrawal movement direction the second suction cup is retracted alone at first, in order to lift the marginal region of the article of sheet form away from the stack before its withdrawal.

As a result of this marginal lifting air can enter from the margin between the article of sheet form to be lifted away and the next article which has to remain on the stack, so that in the subsequent withdrawal of the former adhesion of further copies is avoided.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be explained in greater detail hereinafter by reference to an example of a form of embodiment of the object thereof which is illustrated in the accompanying drawing, wherein:

FIG. 1 shows a lateral elevation of the withdrawal apparatus and of a card stack from which the cards are to be taken singly;

FIG. 2 shows a lateral elevation of the suction device in an intermediate position during the withdrawal movement;

FIG. 3 shows a front elevation of the suction device;

FIGS. 4 and 5 show different positions of the valves provided for the control of the drive device.

DETAILED DESCRIPTION OF THE INVENTION

The apparatus as shown in the drawings serves in the present example to take cards singly from the card stack 1. The card stack 1 is situated in a card magazine for example of a picture postcard vending machine which comprises a bottom rail 2 and a transparent front plate 3. The card stack 1 is held together by two resilient curved retaining arms 4 pressing upon the marginal regions of the cards, one of which arms is visible in FIG. 1, these arms being secured on the bottom rail 2 of a further card magazine (not shown) situated thereabove.

The withdrawal apparatus comprises a suction device 5 which can be moved to and fro in the stack direction and a drive device 6, represented only diagrammatically in the drawing, for the advance and retraction of the suction device 5.

The suction device 5 comprises two suction cups 7 and 8 which are so arranged in relation to the card stack 1 that the first suction cup 7 comes to act in the middle part and the second cup 8 comes to act on the lower margin of the card to be taken in each case. The suction device 5 is connected with a longitudinally movably guided drive rod 9 which is arranged coaxially with the first suction cup 7 and comprises a passage 10 serving as suction conduit. The second suction cup 8 is seated, with axis parallel to the drive rod 9, on a cross-carrier 11 firmly connected with the latter, and the first suction cup 7 is seated on a pivot arm 13 which is articulated to the cross-carrier 11 at 12 and is movable in the plane determined by the axes of the suction cups 7, 8. The pivoting range of the pivot arm 13 is limited on the one hand by the front of the cross-carrier 11 and on the other by a stop 14 fitted on the pivot arm and cooperating with a cam 15 on the cross-carrier 11. A flexure spring 16 presses the pivot arm 13 against the stack end of the pivoting range. This pivoting range forms an idle motion in the drive connection to the first suction cup 7, which takes effect in the retraction of the drive rod 9 in a manner as described hereinafter. From the passage 10 in the drive rod 9 a passage 17 in the cross-carrier 11 leads to the second suction cup 8, and through a branch passage 18, which is formed partially by a flexible pipe 19 (FIG. 3), the first suction cup 7 is also connected with the suction conduit.

The drive device 6 comprises a working cylinder 20 with double-acting piston 21, the piston 21 being connected with the drive rod 9 on its front, facing in the direction of advance (arrow 22 in FIG. 1). The suction conduit formed by the passage 10 in the drive rod 9 opens through a passage 23 in the piston 21 into the cylinder chamber 24 on the rear of the piston 21. The forward cylinder chamber 25 and the rear cylinder chamber 24 are connectable with a vacuum pump 28 through program-controlled valves 26 and 27. The suction generated during the withdrawal operation by the vacuum pump 28 is effective both in the working cylinder 20 and through the suction conduit in the suction cups 7, 8. A tension spring 29 arranged in the forward cylinder chamber 25 and acting on the piston 21 serves for the advance of the suction device 5.

On the cross-carrier 11 of the suction device 5 a detent disc 30 is seated on the drive rod 9, by means of which disc the suction device 5 is held in its rearward rest position (position of the detent disc 30 entered in dot-and-dash lines), namely by a pawl 31 which is released on energisation of an electromagnet 32.

The manner of operation of the apparatus as described is as follows:

On release of the pawl 31 the suction device 5 moves under the action of the tensioned spring 29 in the direction of advance indicated by the arrow 22 against the card stack 1 into the working position as represented

in FIG. 1. In this working phase the vacuum pump 28 is not yet in operation. The suction cup 8 is pressed by the force of the spring 29, through the cross-carrier 11, and the suction cup 7 is also pressed by the force of the flexure spring 16 acting upon the pivot arm 13, against the foremost card 33 of the card stack 1.

Now the vacuum pump 28 is set in operation, whereby the retraction of the suction device 5 in the withdrawal movement direction commences (arrow 34 in FIG. 2). The valves 26 and 27 assume in the first retraction phase the position as illustrated in FIG. 1, so that thus the two cylinder chambers 24 and 25 of the working cylinder 20 and, from the cylinder chamber 24 on the rear of the piston, through the passages 23, 10, 17 and 18, the two suction cups 7 and 8 are connected with the vacuum pump 28. Firstly thus the foremost card 33 of the card stack 1 is sucked fast on to the suction cups 7, 8 of the suction device 5. Furthermore the piston 21 begins to move in the withdrawal movement direction (arrow 34 in FIG. 2). In this movement, the differential force deriving from the different sizes of the piston areas on the two sides and the force of the nearly relaxed tension spring 29 act upon the piston 21, the force of the tension spring 29 in this condition being dimensioned so that in this first return phase a resultant force is exerted in the withdrawal movement direction upon the suction device 5. The initially relatively slight retraction force has the effect that the suction device begins to move slowly, which has a favorable effect upon the operation as described hereinafter in the first retraction phase.

During the first retraction phase the first suction cup 7 continues to press the card 33 to be withdrawn upon the card stack 1, under the action of the flexure spring 16, as a result of the idle motion in the drive connection to the first suction cup. The second suction cup 8, which is rigidly connected with the drive rod 9 through the cross-carrier 11 and acts upon the lower margin of the card 33 is thus initially retracted alone. Thus before the withdrawal of the card 33 its lower margin is lifted away from the card stack 1 according to FIG. 2, so that air can enter from the card edge (in the direction of the arrow 35) between the card 33 to be withdrawn and the next succeeding card of the card stack 1.

As soon as the stop 14 has reached the dog 15, that is at the end of the idle motion, the first cup 7 is also operatively connected with the drive device 6. Now the second retraction phase commences in which with the withdrawal movement continuing the first suction cup 7 acting in the middle part of the card 33 draws this card off from the card stack 1, the card 33 being easily detached from the next succeeding card of the card stack 1, which detachment is favored by the access of air to the back of the card. Approximately at the transition from the first to the second retraction phase the valve 27 is rotated into the position as shown in FIG. 4, while the position of the valve 26 remains unchanged, so that now only the cylinder chamber 24 on the rear of the piston of the working cylinder 20 is connected with the vacuum pump 28. Thus, the retraction force and thus the retraction speed are increased. Now the lateral edges of the card 33 are drawn forward under the curved retaining arms 4.

As soon as the suction device 5, with the card 33 held fast on it by suction, has reached its rest position again at the end of the retraction movement, the pawl 31 places itself before the detent disc 30, whereby the withdrawal operation is terminated. Then the valves 26 and 27 are rotated into the position as shown in FIG. 5, whereby the suction effect is interrupted and the card 33 detaches itself from the suction cups 7, 8 and drops into a delivery shaft (not shown).

As long as the vacuum pump 28 continues in operation for a specific time, air is blown into the forward cylinder chamber 25 of the working cylinder 20, which however has no effect in this operational case.

When the card stack 1 is consumed and the suction device 5 encounters the front plate 3 of the card magazine, firstly the suction cups, 7, 8 adhere firmly by suction to the front plate 3 and the retraction phases as described above do not take place. However as soon as the program control system effects the rotation of the valves 26, 27 into the position as shown in FIG. 5, the suction effect disappears so that the suction cups 7, 8 disengage from the front plate 3 and the suction device 5 is moved back into its rest position against the force of the tension spring 29 under the action of the air blown by the vacuum pump 28 into the forward cylinder chamber 25 of the working cylinder 20.

Of course it is possible for several suction devices, connected with one common drive device, to be provided for the withdrawal of larger articles of sheet form.

What we claim is:

1. An apparatus for the single withdrawal of articles of sheet from a stack, especially for picture postcard vending machines, having a suction device connected to a vacuum pump and movable to and fro in the direction of the stack and a drive device for the advance and retraction of the suction device, characterized in that:

the suction drive comprises two suction cups which are so arranged in relation to the stack that the first suction cup comes to act in the middle part and the second cup comes to act adjacent the edge of the article of sheet to be withdrawn, and in that

the drive device includes a longitudinally movable guided drive rod; and in that

the suction device includes a cross-carrier connected to an end of the drive rod and extending transversely from the drive rod, a pivot arm pivotally connected to the cross-carrier and movable in a plane determined by the axes of the suction cups, stops limiting the pivoting range of the pivot arm, and a spring connected to the cross-carrier and the pivot arm for pressing the pivot arm toward the stack end of the pivoting range, the first suction cup being located on the pivot rod substantially in coaxial alignment with the drive rod, and the second suction cup being located adjacent the pivotal connection of the cross-carrier to the pivot arm, the axis of the second suction cup being parallel to the drive rod, whereby the drive device is operatively connected to the suction device to provide a limited amount of idle motion between the drive device and the first cup during the beginning of the retraction of the suction device in the withdrawal movement direction, so that the second suction cup is firstly retracted alone, thus lifting the edge of the article of sheet form away from the stack before its withdrawal.

2. An apparatus according to claim 1, characterized in that the retraction force exerted upon the suction device by the drive device at the beginning of the withdrawal movement is less during the single movement of

the second suction cup than after the commencement of the action of the force upon the first suction cup.

3. An apparatus according to claim 1 characterized in that the drive device comprises a working cylinder with double-acting piston, the piston being connected with the drive rod on its forward side facing in the direction of advance, while a suction conduit connected with the suction cups and formed by a passage in the drive rod opens through a passage in the piston into the cylinder chamber on the rear of the piston, further in that

the two cylinder chambers are connectable with the vacuum pump through program controlled valves and in that

the controlling of the valves for the retraction of the piston and thus of the suction device is arranged in such a way that in a first retraction phase at the beginning of the withdrawal movement of the suction device the two cylinder chambers are connected with the vacuum pump and in a subsequent second retraction phase only the cylinder chamber to the rear of the piston is connected with the vacuum pump.

4. An apparatus according to claim 3, characterized in that for the advance of the suction device there is provided a balance spring whose force is dimensioned so that in the first retraction phase a resultant force is exerted in the withdrawal movement direction upon the suction device.

* * * * *