Nov. 19, 1940. H. T. BACKHOUSE 2,222,459

SHEET SEPARATING AND FEEDING MACHINE

Filed Dec. 15, 1937 2 Sheets-Sheet 1

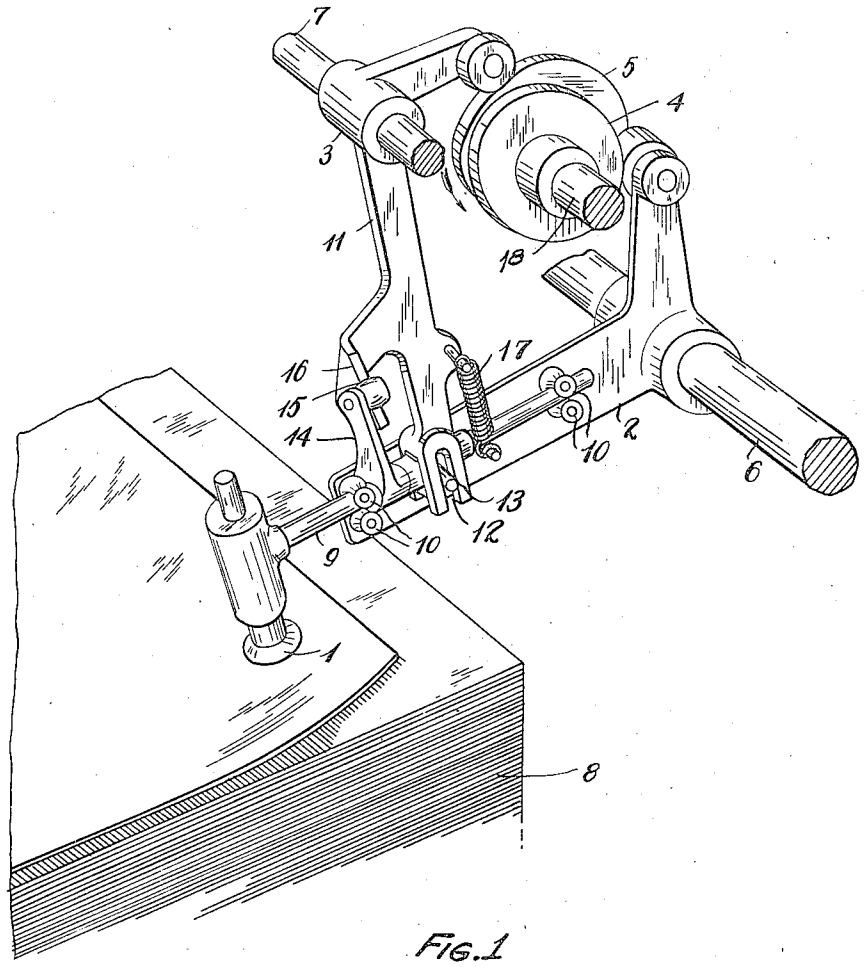


FIG. 1

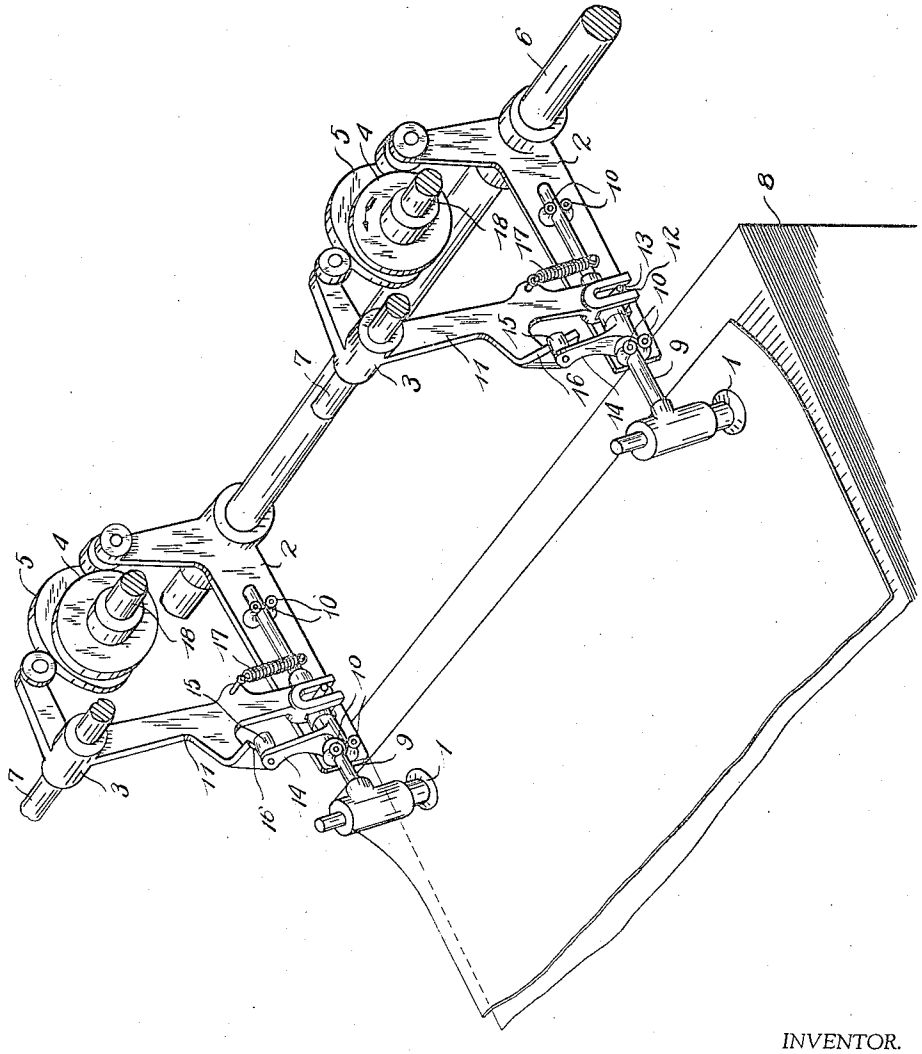
INVENTOR.
HEADLEY TOWNSEND BACKHOUSE
BY Lewis Hudson & Kent
ATTORNEYS

Nov. 19, 1940. H. T. BACKHOUSE 2,222,459

SHEET SEPARATING AND FEEDING MACHINE

Filed Dec. 15, 1937 2 Sheets-Sheet 2

Fig. 2



INVENTOR.
HEADLEY TOWNSEND BACKHOUSE
BY Lewis Hudson & Kent
ATTORNEYS

Patented Nov. 19, 1940 2,222,459

UNITED STATES PATENT OFFICE

2,222,459

SHEET SEPARATING AND FEEDING MACHINE

Headley Townsend Backhouse, London, England

Application December 15, 1937, Serial No. 179,938
In Great Britain December 19, 1936

8 Claims. (Cl. 271—26)

This invention consists in improvements in or relating to sheet separating and feeding machines and has reference to machines of the kind (hereinafter referred to as the kind described) in which sheets of paper card or the like are, one at a time, partly lifted from the top of a pack, stretched at the portion lifted and forwarded in a direction parallel to the plane of the top of the pack. The invention is particularly, though not exclusively, concerned with machines of this kind in which the sheets are forwarded from the pack to a conveyor which carries them in partly underlapping formation (i. e., in the form of a continuous stream of underlapping sheets) to a printing press or other machine.

Various arrangements of sheet grippers (e. g., suction grippers) including combined lifting and forwarding grippers, co-operating sets of separate lifting and forwarding grippers, combing wheels and air-blast devices operable to assist separation, stretching means associated either with the lifting or with the forwarding grippers have already been proposed, as in my prior Patent No. 2,108,702, issued February 15, 1938, for the purpose of effecting in desired sequence the operations of separation, lifting, stretching and forwarding.

According to the present invention a machine of the kind described is characterised in that the operations of lifting, stretching and forwarding, or controlling the forwarding, of the sheets are effected by a single set of sheet grippers (preferably suction grippers), each of which moves in a direction towards and away from the top of the pack to lift the sheet and also in a direction along the top of the pack to forward the sheet and at least one of which has also a movement in a direction transverse to the feeding direction to stretch the sheet.

Preferably the grippers are also given a movement, after they have gripped the sheet and prior to the forwarding movement, in a backwards direction (i. e., opposite to the forwarding direction) to assist in the separation of the sheet from the pack, such movement being disclosed also in my said prior patent.

The grippers preferably operate at the rear edge of the pack and the separation may be assisted by the use of combing wheels or bucklers, air blast directed under the lifted edge of the sheet and one or more presser feet or second sheet stops arranged to rest on the top of the pack underneath the lifted sheet and to prevent movement of a second sheet.

The movement of the grippers may be effected either entirely by mechanical means or it may be effected by mechanical means in conjunction with suction, the grippers in the latter case being for example made telescopic and arranged to collapse to lift the sheet under the influence of suction and to be returned to their extended position by spring means on release of the suction.

In one arrangement according to the invention at least one of the grippers is mounted upon an arm extending in the forwarding direction and arranged for oscillation (e. g., by means of a cam) in a plane at right angles to the top of the pack to effect the lifting and falling movement of the gripper and the mounting is such that the gripper is capable of two kinds of movement in relation to the arm, one a reciprocatory movement in the direction of the length of the arm to effect the forwarding and the other an arcuate movement about an axis extending in the lengthwise direction of the arm to effect the stretching of the sheet.

One specific example of the use of mechanical means for effecting the movements of the suckers according to the invention will now be described with reference to the accompanying diagrammatic drawings, in which Fig. 1 is a perspective view of one sucker and its operating mechanism, and Fig. 2 is a similar view showing two suckers arranged along one edge of the pack.

In this example two suction grippers 1 are employed operating respectively over the rear corners of the pack. Associated with each sucker is operating mechanism in the form of two bellcranks 2, 3, which together have the general form of a rectangle lying in a vertical plane with one pair of sides substantially vertical. The bellcranks are supported for rocking movement on two shafts 6, 7 extending parallel to and behind and above the rear edge of the pack 8. Cams 4, 5 mounted on the rotating shaft 18 act on the arms of the bellcranks to produce this rocking movement. The two shafts 6, 7 are located at opposite ends of one diagonal of the rectangle and the cams 4, 5 and sucker 1 are located at the opposite ends of the other diagonal with the sucker at the lower corner of the rectangle nearer to the pack. The sucker is mounted on a rod 9 arranged for longitudinal sliding movement in guides 10 on the arm of the bellcrank 2 (hereinafter referred to as the lifting bellcrank) constituting the bottom of the rectangle and the movement in this direction is controlled by the vertical arm 11 of the other bellcrank (hereinafter referred to as the forwarding bellcrank) which has a slotted end 12 engaging with a boss 13 formed on the rod 9. The rod 9 is also arranged for rotational movement about its axis in relation to the lifting bellcrank and is provided with an upwardly-extending arm 14 having a roller 15 cooperating with a cam surface 16 on the vertical arm 11 of the forwarding bellcrank. The sucker is dependent from the rod and the arrangement is that as the arm of

the lifting bellcrank moves upwardly carrying the rod and sucker with it, the rod is rotated under the action of the cam and a spring 17 in the direction to move the sucker towards the adjacent side of the pack (i. e., in the outward direction). It will be understood that, as shown in Fig. 2, the cams 16 may be formed with their slopes in opposite directions to cause movement of the suckers toward their respective adjacent sides of the pack.

In operation the sucker is first moved downwardly on to the top of the pack by rocking movement of the lifting bellcrank 2 under the action of its cam 4, suction is applied to cause the sucker to grip the top sheet, and the bellcrank then rocks to lift the sucker carrying with it the rear edge of the sheet. During the upward movement the sucker is moved outwardly to stretch the sheet by rotation of its supporting rod 9 under the spring action controlled by the cam surface 16 on the forwarding bellcrank as described above and the forwarding bellcrank is then rocked to slide the supporting rod in relation to the lifting bellcrank and to effect the forwarding movement of the sucker into the position shown in the drawings. Finally the suction is released and the sucker returned to its original position, by reverse movements of the bellcranks, ready to grip the next sheet.

The cam 5 controlling the bellcrank 3 may be so shaped that before or during the upward movement of the sucker a short rearward movement may be given to the sucker by means of the forwarding bellcrank and the cam 4 may be so shaped that during the forwarding movement the sucker may be given a downward movement by means of the lifting bellcrank.

It is not essential that the outward stretching movement of the sucker be carried out during the lifting movement. It may for example by the use of suitable means be effected during the forwarding movement or immediately before that movement is begun. Further, it is not essential that both of the suckers be moved to effect the stretching. The stretching may well be effected by outward movement of one sucker in relation to the other.

I claim:

1. In a machine for feeding sheets from the top of a pile by means acting at the rear end only of each sheet, a pair of sheet gripper suckers arranged at the rear corners of the pile, means for moving said suckers toward and away from the pile to lift the rear of the sheet and for moving one of said suckers to a slight extent in a direction transverse to the feeding direction to stretch the rear edge of the sheet, and for moving the suckers lengthwise of the pile to forward the lifted sheet.

2. In a machine for feeding sheets from the top of a pile by means acting at the rear end only of each sheet, a pair of sheet gripper suckers arranged at the rear corners of the pile, means for moving said suckers toward and away from the pile to lift the rear of the sheet, and for simultaneously moving one of said suckers to a slight extent in a direction transverse to the feeding direction to stretch the rear edge of the sheet as it rises, and for moving said suckers lengthwise of the pile to forward the lifted sheet.

3. In a machine for feeding sheets from the top of a pile by means acting at the rear end only of each sheet, a pair of forwardly extending arms arranged at the rear corners of the pile to swing about a horizontal transverse axis, a pair of rods mounted in said arms for longitudinal movement therein, suckers carried by said rods, means for swinging said arms to raise and lower said suckers, means for reciprocating said rods to produce forward and return movement of said suckers, the rod on one of said arms being oscillatable, and means for oscillating said last mentioned rod.

4. In a machine for feeding sheets from the top of a pile by means acting at the rear end only of each sheet, a pair of arms arranged at the rear corners of the pile to swing about a horizontal transverse axis, a pair of rods mounted in said arms for longitudinal movement therein, suckers carried by said rods, means for swinging said arms to raise and lower said suckers, means for reciprocating said rods to produce forward and return movement of said suckers, the rod on one of said arms being oscillatable, and means brought into action by the raising of said last named arm for oscillating said last named rod to swing its sucker outward for stretching the sheet.

5. In a machine for feeding sheets from the top of a pile by means acting at the rear end only of each sheet, a pair of forwardly extending arms arranged at the rear corners of the pile to swing about a horizontal transverse axis, a pair of rods mounted in said arms for oscillatory and longitudinal movement therein, suckers carried by said rods, a rotating shaft, means driven by said shaft for swinging said arms to raise and lower said suckers, lever means for reciprocating said rods in said arms, means driven by said shaft for swinging said lever means, and means effective to oscillate said rods to swing said suckers outwardly while gripping the sheet.

6. In a machine for feeding sheets from the top of a pile by means acting at the rear end only of each sheet, a pair of arms arranged at the rear corners of the pile to swing about a horizontal transverse axis, a pair of rods mounted in said arms for longitudinal movement therein, suckers carried by said rods, a rotating shaft, means driven by said shaft for swinging said arms to raise and lower said suckers, lever means for reciprocating said rods in said arms, means driven by said shaft for swinging said lever means, and means associated with the lever means for one of said suckers and brought into action by the vertical movement of the corresponding arm for oscillating the corresponding rod to swing its sucker outwardly and stretch the sheet.

7. In a machine for feeding sheets from the top of a pile by means acting at the rear portion only of each sheet, a pair of sheet gripper suckers arranged near the rear upper corners of the pile, means for moving the suckers toward and away from the pile to lift the rear portion of the sheet, means for moving the suckers relatively in a direction transverse to the feeding direction to stretch the rear portion of the sheet, and means for moving the suckers in the feeding direction to forward the lifted sheet.

8. In mechanism for feeding sheets in partly underlapped formation from a pile, a pair of sheet gripper suckers arranged near the rear upper corners of the pile, means for moving the suckers toward and away from the pile to lift the rear portion of the sheet, means for moving the suckers relatively in a direction transverse to the feeding direction to stretch the rear portion of the sheet, and means for moving the suckers in the feeding direction to forward the lifted sheet.

HEADLEY TOWNSEND BACKHOUSE.