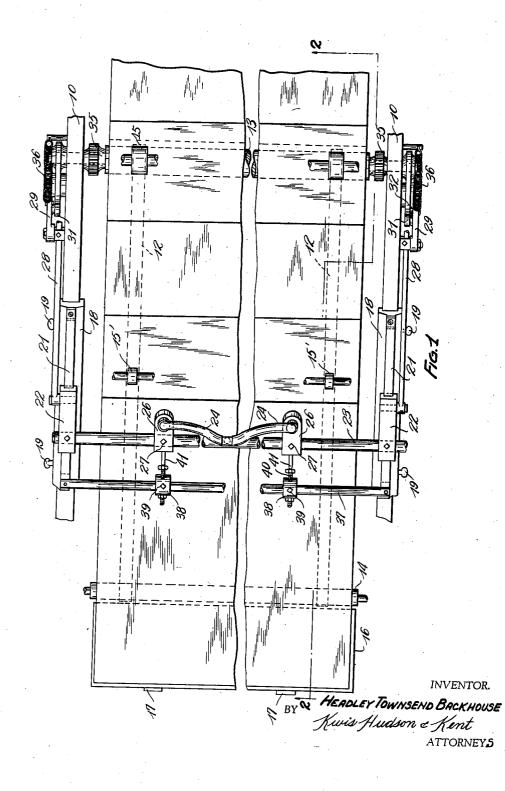
June 2, 1942.

H. T. BACKHOUSE SHEET FEEDER Filed Aug. 1, 1940 2,285,076

2 Sheets-Sheet 1

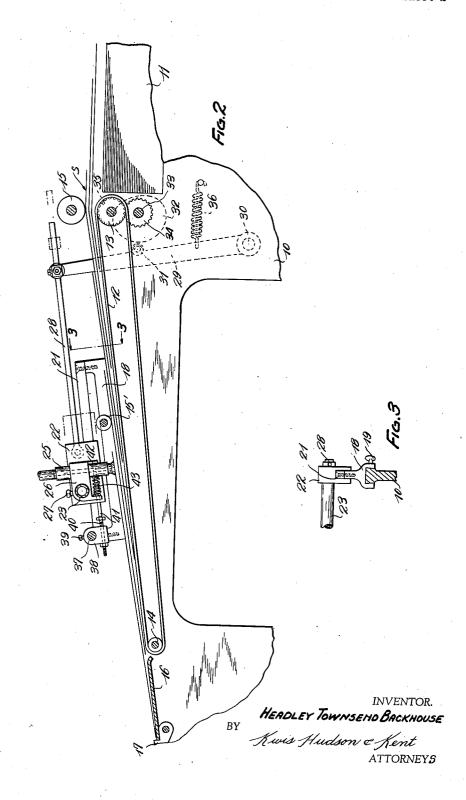


June 2, 1942.

H. T. BACKHOUSE SHEET FEEDER Filed Aug. 1, 1940

2,285,076

2 Sheets-Sheet 2



2,285,076

UNITED STATES PATENT OFFICE

2,285,076

SHEET FEEDER

Headley Townsend Backhouse, London, England

Application August 1, 1940, Serial No. 349,325 In Great Britain August 11, 1939

(Cl. 271-46) 8 Claims.

This invention relates to sheet feeders, that is means for feeding sheets to printing machines or other sheet handling machines, and has to do with means for conveying sheets of paper, card or the like from a pile to a printing press or 5 other machine to which the sheets must be presented in registered relationship and which is provided with front stops that engage the front edge of each sheet in turn and momentarily arrest its movement, so that it slides on the con- 10 veyor, for the purpose of obtaining registration of the front edges of the sheets. The invention is particularly, but not exclusively, concerned with conveyors of the kind described which are arranged to convey the sheets in the form of a 15 continuous stream of partly underlapping sheets.

A difficulty which arises in the operation of conveyors of the kind described is that if the rate of movement of the sheets is high or if the sheets being conveyed are of a flimsy nature 20 tain parts in vertical section substantially on the there is a tendency to buckle the front edges of the sheets when they come into contact with the front stops. Various means have been proposed, such as the use of a variable speed drive for the conveyor, for reducing the speed of the sheets 25 sheet feeding or to stream feeding, but an eximmediately before they come into contact with the stops. As soon as the edge of a sheet has reached the front stops however, it is desirable that the conveyor should tend to carry the sheet forward at a high speed so as to effect the regis-30 tration in the shortest possible time and to maintain it in position against the front stops. Owing to the difficulty of effecting a rapid acceleration of a variable speed conveyor it is not possible in practice to arrange a variable speed conveyor so that it tends to move the sheet in this way. It is an object of the present invention to provide an improved conveyor of the kind described in which the above difficulties are reduced or over-40

The invention provides a conveyor of the kind come. described which is characterized by means for gripping the sheets and slowing down the movement of the sheets as they approach the front stops without a corresponding reduction in the 45 speed of the conveyor so that the sheets slip in relation to the conveyor, the gripping means being arranged to release the sheets when they strike the stops or immediately before so that 50 while the sheets strike the stops at less than full conveying speed they are pressed up to the stops by the conveyor operating at its full speed.

Preferably, the gripping means are arranged to engage the sheets at or near their rear edges; considered in the direction of movement. The 55

gripping means may consist of one or more suckers and in the case of a conveyor which is arranged to feed the sheets in the form of a continuous stream the suckers are conveniently arranged to engage the upper surface of the sheets.

In one form of the invention the gripping means are arranged to move initially, i. e. as they take hold of the sheets, at the same speed as the sheets and then to slow down.

One of the primary objects of the invention is the provision of means for slowing down the movement of a sheet as it approaches the front stops in order to avoid buckling or rebound of the sheet.

In the drawings,

Fig. 1 is a fragmentary plan view of a stream feeder embodying the invention.

Fig. 2 is a side elevation of the same with cer-

Fig. 3 is a detail sectional view taken substantially on the line 3-3 of Fig. 2.

The invention is adapted either to sheet by herein illustrated. In the case of a sheet by sheet feeder the sheet conveying surface is that of the conveyor tapes, whereas in a stream feeder the conveying surface acting upon the foremost sheet is primarily the surface of the next underlying sheet.

Fragments of the side frame members of a sheet feeder are shown at 10 in the drawings. 35 A pile of sheets 11 carried in the frame may be supported in the conventional manner and automatically lifted as the feeding progresses, as is well known in the art. Means for separating the sheets one at a time from the pile and starting them forward are employed, but are not herein illustrated.

The stream of sheets thus formed is indicated schematically at S. The stream is caused to move forward at constant speed by suitable means, as for example by a conveyor made up of a plurality of endless tapes 12 running over a driven roller 13 and an idler roller 14. Presser wheels 15 bear on the stream above the roller 13, whereby the forward edges of the sheets are gripped and moved positively in the forward direction as they leave the pile. Additional presser wheels (5' bear on the sheets above tapes 12 to insure forward travel of the sheets in the usual manner. Beyond the forward end of the conveyor there is a feed board 15, and front stops

17 are arranged to swing up at the proper times into position in advance of the feed board by means of any suitable or known mechanism.

On each of the two frame side members 10 I mount a bracket 18 which may be held in place by set screws 19 or the like. Each bracket 18 is provided with upstanding ends to which are fastened a rectangular bar or track 21 upon which is carried a slide block 22. These two blocks 22 are joined by a tube 23 which is connected through a flexible conductor with a suction pump, a suitable suction control valve, not shown, being interposed in the line. Half-way between the blocks 22 two hose connections 24 lead from the tube 23 to suckers 25 that are mounted in 15supporting brackets 26 in a position slightly above the surface of the sheets so that the latter may pass freely under the suckers, these brackets being adjustable along the tube 23 and being secured in desired positions by set screws 27. The 20 blocks 22, together with the tube 23 and the suckers 25, are reciprocated along the tracks 21 by links 28 pivotally connected with the blocks. These links are in turn pivotally connected with the upper ends of levers 29 which are pivotally 25 mounted in the frame side members at 30.

Each of the levers 29 carries a follower 31 which runs upon a cam 32 that is mounted to turn upon a short shaft 33 to which is keyed a gear $3\hat{4}$ that meshes with a gear 35 fixed to the 30 driven roller 13. A spring 36 tends to hold each of the followers 31 against its cam, and the rotation of the cam therefore causes levers 29 to swing back and forth, reciprocating the blocks 22 on the tracks 21. 35

A rod 37 is secured at its ends to the forward extremities of the tracks 21, and intermediate its length this rod carries small brackets 38 which are adjusted to positions opposite the brackets 26 and fastened there by set screws 39. Each of these brackets 38 carries an adjustable stop 40 which is adapted to engage a plunger 41 slidable in a downturned lip on the adjacent bracket 26 and extending through an aligned bore in the sucker 25. On its rear end this 45 plunger carries a head 42 of sufficient size to cover a bleed port in the sucker surrounding the bore for the plunger. Coil spring 43 normally holds the head 42 in port-closing position. When the plunger 41 strikes the stop 40 the head 42 is 50 unseated and the suction is broken, whereby the sheet is immediately released by the sucker. The exact point of release of the sheet may therefore be regulated to a nicety.

The cam drive mechanism for reciprocating 55 the suckers and the valve mechanism for controlling the application of vacuum to the suckers are so proportioned and timed that during the forward travel of the suckers they accelerate to approximately the same speed as the conveying surface, at which point suction becomes effective and the suckers grasp a sheet. Thereafter the speed of the suckers gradually decreases whereby the sheet is slowed down and caused to slip on the conveying surface which continues at normal speed. When the foremost sheet reaches 65approximately the position indicated in Fig. 2 the plungers 41 strike the stops 40 and the valves 42 begin to open, whereby the suction is broken. The uppermost sheet now lies upon the next 70underlapped sheet and takes a forward impetus from the travel of that sheet. It then settles forward against the stops 17 gently and without buckling or rebound.

5

draw the sheet forward against the restraining influence of the suckers, thereby straightening out any waves or buckles that there may be in the sheet. The sheet is carried forward in this manner until its leading edge is very close to the front stops when the suction is cut off and the movement of the conveying surface carries the sheet forward to the front stops, endeavoring to accelerate it. Owing to the inertia of the 10 sheet the acceleration takes an appreciable time and consequently the sheet does not gain much speed by the time it reaches the front stops. However, the conveying surface moving at its full speed operates to register the sheet against the stops rapidly and to maintain it in its position against the stops.

It will be understood that when a conveyor is employed to handle sheets fed singly the slippage occurring after the suckers grasp the sheet takes place directly between the conveyor and the sheet rather than between the uppermost sheet and the next underlying sheet in the example illustrated.

Having thus described my invention, I claim: 1. In a sheet feeder, front stops, means for advancing a stream of underlapped sheets toward said stops, and means for slowing down each sheet in turn as it approaches said stops comprising suction means arranged and operated to seize the upper surface of the rear portion only of each sheet and moving in the direction of sheet travel only to slow the sheet down to a speed slower than the speed of the next succeeding sheet of the stream, and to release the sheet before its forward edge strikes said stops whereby the sheet is thereafter free to be front and side registered.

2. In a sheet feeder, front stops, means for advancing a stream of underlapped sheets toward said stops, and means for slowing down 40 each sheet of the stream in turn as it approaches said stops comprising suction means adapted to seize the upper surface of the rear portion only of each sheet at a plurality of transversely spaced points, means for imparting variable movement to said suction means in the feeding direction including speeds approximately equal to and substantially less than the speed of the sheets of the stream, said suction means being operated to seize each sheet while moving at approximately the speed thereof and to release the same before its forward edge strikes said stops and while the sheet is moving at a substantially slower speed.

3. In a sheet feeder, front stops, means for advancing a stream of underlapped sheets toward said stops, and means for slowing down each sheet of the stream in turn as it approaches said stops comprising suction means adapted to seize the upper surface of the rear portion only of each sheet at a plurality of transversely spaced points, means for imparting linear movement to said suction means in the feeding direction including speeds approximately equal to and substantially less than the speed of the sheets of the stream, said suction means being operated to seize each sheet while moving at approximately the speed thereof and to release the same while moving at a substantially slower speed before the sheet reaches said front stops.

4. In a sheet feeder, front stops, a conveyor arranged to advance sheets toward said stops, means for slowing down each sheet in turn as The conveying surface therefore tends to ⁷⁵ means arranged and operated to seize the upper

60

5

surface of the rear portion of each sheet and move forward therewith at a speed slower than the speed of said conveyor, and means controlled through forward movement of the suction means for causing the latter to release the sheet at a predetermined point in the forward travel thereof.

5. In a sheet feeder, front stops, a constant speed conveyor arranged to advance sheets toward said stops, and means for slowing down 10 comprising a transverse member, a pair of suckeach sheet in turn as it approaches said stops comprising suckers adapted to seize the upper surface of the rear portion of each sheet, a transverse support on which said suckers are mounted in spaced relation, means for imparting variable 15 movement to the transverse support including speeds approximately equal to and substantially less than the speed of said conveyor, said suction means being operated to seize each sheet while moving at approximately the speed of said 20 conveyor and to release the same before its forward edge strikes said stops and while the sheet is moving at a substantially slower speed.

6. In a sheet feeder, front stops, a constant speed conveyor arranged to advance sheets 25 toward said stops, and means for slowing down each sheet of the stream in turn as it approaches said stops comprising suction means adapted to seize the upper surface of the rear portion of each sheet, means for imparting reciprocating 30 and means actuated by the forward travel of the movement to said suction means in a direction parallel to the feeding direction including speeds approximately equal to and substantially less than the speed of said conveyor, said suction

means being operated to seize each sheet while moving at approximately the speed of said conveyor and to release the same while moving at a substantially slower speed before the sheet reaches said front stops.

7. In a sheet feeder, front stops, means for advancing a stream of underlapped sheets toward said stops, and means for slowing down each sheet in turn as it approaches said stops ers carried thereby, guides on the opposite sides of the stream path upon which said transverse bar is movably supported, means for causing said bar to move forward first at the speed of the stream and thereafter at a decreasing speed and to cause said suckers to grasp the uppermost sheet while the bar is moving at stream speed and to release the sheet just prior to the arrival thereof at said front stops.

8. In a sheet feeder, front stops, means for advancing sheets toward said stops, a sucker arranged to grasp the uppermost sheet near its rear edge, means for reciprocating said sucker backward and forward above the path of travel of the sheets, said sucker at one point in its forward travel moving at sheet speed and adapted to grasp the uppermost sheet at that speed, said reciprocating means being arranged to slow down the said travel of the sucker thereafter, sucker for breaking the suction therein when the sucker reaches a predetermined point in its forward travel.

HEADLEY TOWNSEND BACKHOUSE.