Sept. 7, 1943. H. T. BACKHOUSE 2,328,943

MEANS FOR REGISTERING SHEETS

Filed April 17, 1941 2 Sheets-Sheet 1

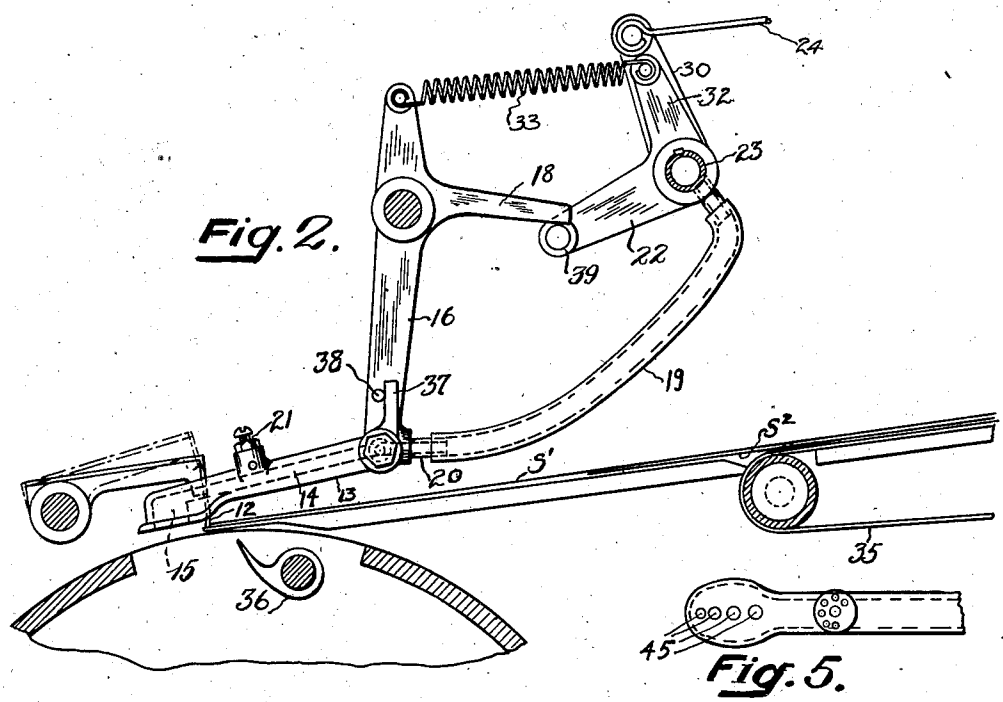


Fig. 2.

Fig. 5.



Fig. 6.

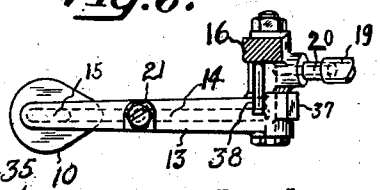


Fig. 4

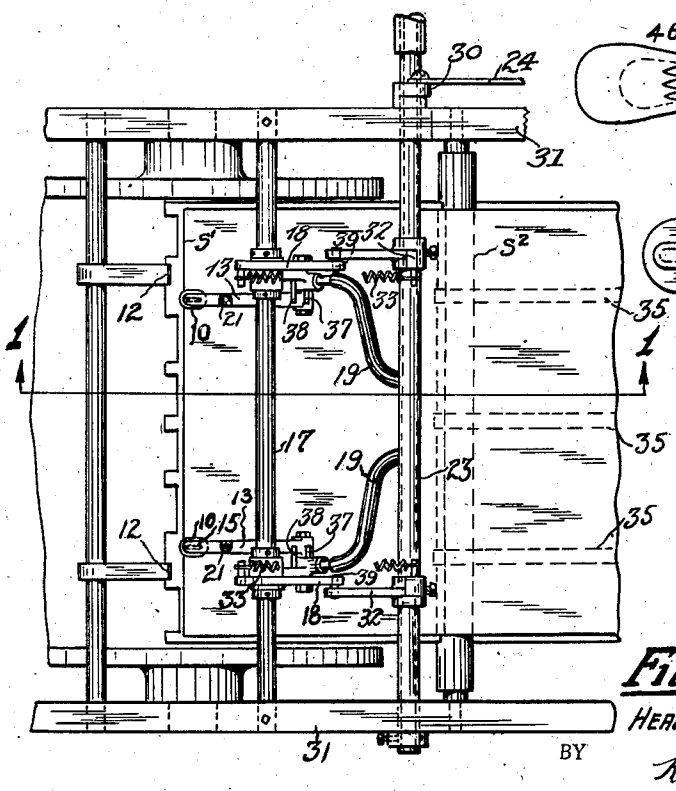


Fig. 3

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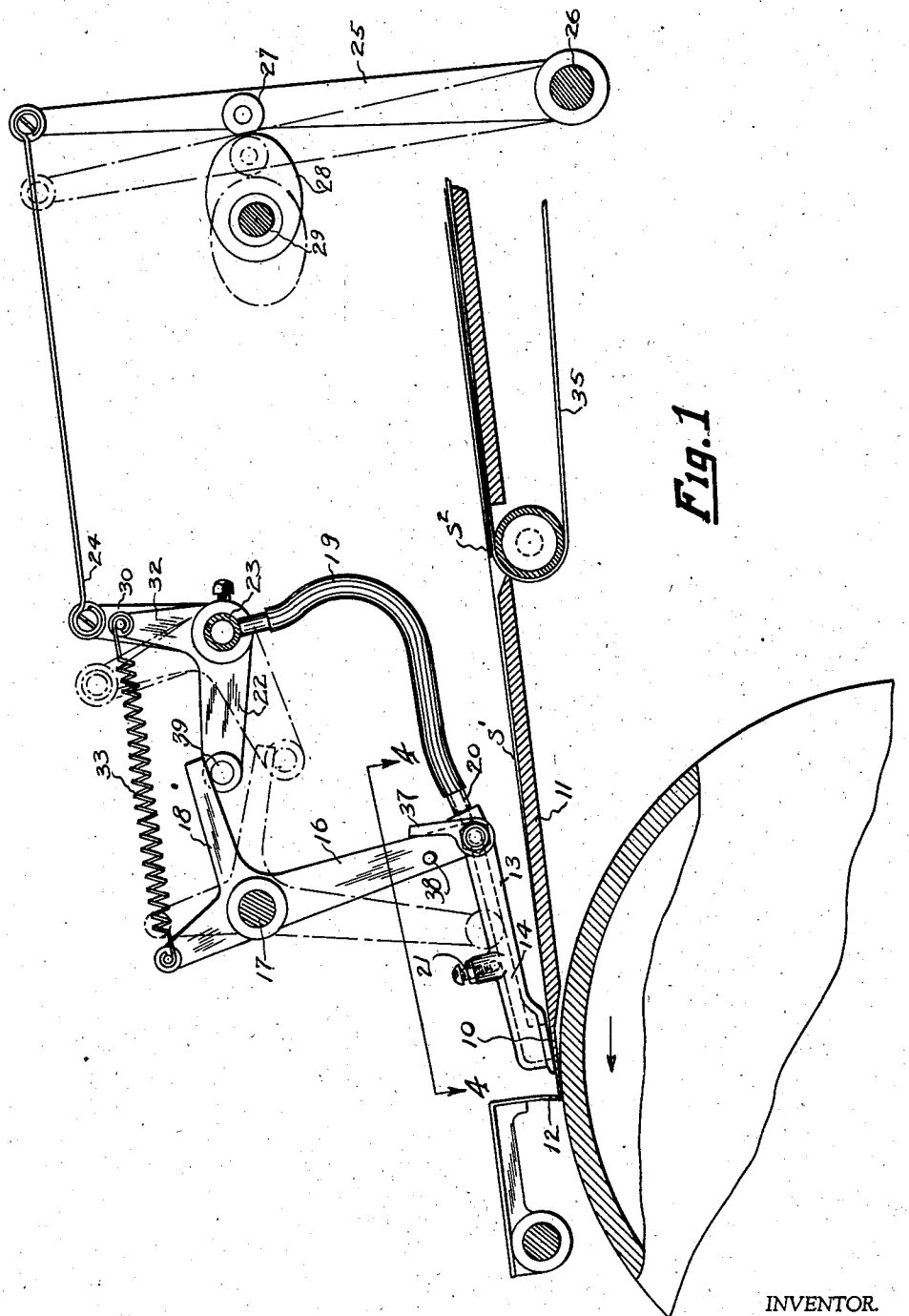


Fig. 1

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Patented Sept. 7, 1943

2,328,943

UNITED STATES PATENT OFFICE

2,328,943

MEANS FOR REGISTERING SHEETS

Headley Townsend Backhouse, London, England

Application April 17, 1941, Serial No. 389,000
In Great Britain April 20, 1940

6 Claims. (Cl. 271—54)

This invention relates to improvements in means for registering sheets. The invention has to do with mechanisms for feeding sheets to a printing press or the like, particularly sheets moving in lapped relation. The invention utilizes one or more suckers moving back and forth in the direction of sheet travel, which suckers function not only to draw the sheet into register with front guides, but also to slow down the sheet travel.

A difficulty which arises with mechanisms of this kind when the sheets are moving at a high speed is that the sheets tend to buckle when they strike the front guides or to bounce back. It is an object of the present invention to provide improved means for overcoming or reducing this difficulty.

The invention consists in mechanism for registering sheets of paper, card or the like, being fed to a printing press or other machine, characterized by one or more suckers mounted above the feed board and arranged to grip the leading portion of each sheet in turn as it approaches the front guides, to move with the sheet until the front edge of the latter reaches the front guides and then either to release the sheet or, while still gripping it, to slide over the sheet leaving it at rest against the front guides and then to release the sheet, the sucker or suckers finally returning to initial position ready to engage the next sheet.

In the preferred form of the invention the sucker is moved, while gripping the sheet, at a speed less than that at which the sheets are moved by the feeding means. When the mechanism is arranged to operate in this way the sheets are not only taken up to the front guides under the positive control of the sucker, but approach the guides at comparatively low speed without substantially reducing the speed of operation of the feeding mechanism as a whole.

In one embodiment of the invention the sucker is arranged to rest upon the feed board at the beginning of each cycle of movements and is so shaped as to provide, in conjunction with the feed board, a guide leading the edge of the moving sheet between the sucker and the feed board so that the sheet slides under the sucker.

In the preferred construction of this embodiment the sucker comprises a flat surface of metal or other hard material having a suction orifice and arranged to lie, at the beginning of the cycle of movements, with its rear edge, considered in the direction of movement of the sheet, slightly raised off the feed board and its front edge in contact with the feed board, thereby facilitating the entry of the sheet between the sucker and the feed board.

The arrangement of the mechanism may be such that during the operation of the machine suction is applied continuously to the sucker and each sheet as it is fed under the sucker face acts as a valve, sealing the orifice and thereby allowing the suction to build up inside the sucker to cause it effectively to grip the sheet. Alternatively the mechanism may be provided with a mechanically timed valve to control the application of suction to the sucker.

The mechanism may be so arranged that the sucker is at rest when the sheets move into engagement with it, or it may have already started its movement toward the front guides at the time when it is engaged by the sheet. One specific embodiment of the invention will now be described by way of example, reference being had to the accompanying drawings, wherein.

Fig. 1 is a fragmental side elevational view, partly in longitudinal section, of apparatus embodying the invention and showing the sucker in a rearward position.

Fig. 2 is a similar view showing the sucker in its raised and furthest forward position.

Fig. 3 is a fragmental plan view on a smaller scale.

Fig. 4 is a detail plan view of one of the suckers, and

Figs. 5 and 6 are detail views of modified forms of suction nozzle which may be employed in connection with the invention.

In the illustrated embodiment there are two suckers 10 spaced apart across the feed board 11 at positions to engage the leading edge of each sheet as it approaches the front guides 12, two of which are shown herein. The two suckers are similarly arranged and the description will therefore be confined to one of them. Each sucker is carried at the forward end of an arm 13 provided with an air passage 14 with which the orifice 15 of the sucker communicates. The rear end of arm 13 is carried by a depending leg 16 of a lever which is pivotally supported upon a shaft or rod 17 that extends across and above the feed board. In addition to the depending leg 16 each lever has another integral leg 18 rearwardly directed, the sucker arm 13 being pivotally attached to the lower free end of the leg 16.

The sucker itself is provided with a flat face extending at an acute angle to the surface of feed board 11, in which face the suction orifice 15 is located. The arm 13 extends forwardly from

the arm 16, that is in the direction of movement of the sheets, and slightly downwardly, the angle being such that at the beginning of the cycle of sucker movements the forward end of the flat face lies on the feed board and the rear end is lifted above it by an amount slightly greater than the thickness of the sheets to be handled.

Suction is continuously communicated to the passage 14 in the sucker arm 13 by a flexible tube 19 connected to a nipple 20 fixed to the lever leg 16 and having a connection to the sucker arm 13 through the pivot. In order to provide a control for the degree of suction applied to the sucker orifice there is an adjustable leak valve 21 on the sucker arm arranged to admit a controlled amount of air to the passage in the arm.

The movements are transmitted to the sucker by oscillation of the lever 16, 18 about its pivot 17. These oscillations are effected by means of an arm 22 fixed on a hollow shaft 23 extending across the feed board behind the lever shaft 17. The free end of arm 22 carries a pin 39 which engages under the end of the lever arm 18. The shaft 23 is given an oscillatory movement by means of a rod 24, the rear end of which may be attached to an oscillatory post 25 pivotally mounted at its lower end, as indicated at 26. On this post I mount a small roller 27 which is engaged by a cam 28 keyed to a shaft 29 that rotates once for each cycle of movement of the machine, that is to say for each sheet fed. The forward end of the rod 24 is attached to a crank 30 fixed upon the shaft 23 outside the frame 31 of the machine. Formed preferably integral with each arm 22 there is an upstanding arm 32 to which is attached one end of a tension spring 33 the opposite end of which is attached to an upstanding arm 34 integral with the lever 16, 18. Hence when the shaft 23 is oscillated clockwise to the position indicated in Fig. 1 spring 33 is placed under tension. On the other hand, when shaft 29 revolves through 180° from the position of Fig. 1 the spring 33 contracts and swings shaft 23 to the Fig. 2 position and at the same time swings lever 16, 18 to the position of that figure. The shaft 23, being hollow, may be utilized for communicating suction to the flexible tube 19.

The cycle of movements of the sucker is such that it lies on the feed board in the manner described above as the leading sheet approaches the front guides 12 and until the front edge of the sheet has been fed under the sucker and has been gripped by it. The lever 16, 18 is then rocked in the direction to move the sucker forwardly toward the front guides, the speed of movement being preferably less than that at which the sheets are fed by the conveyor 35 or other feeding device. When the front edge of the sheet reaches the front guides the movement of the sheet is stopped by its engagement with the guides. The sucker continues its movement, sliding on the sheet until it has passed beyond the front edge of the sheet. It is then lifted clear of the sheet to allow the latter to be drawn under the sucker by the grippers of the printing machine indicated at 36 in Fig. 2. This lifting of the sucker is effected by final rocking of the lever 16, 18 when the latter swings in the forward direction, which brings the stop 37 carried on the sucker arm 13 into engagement with an abutment 38 on the lever leg 16 to prevent rotation between the two elements 13 and 16, and causing them to move thereafter as a unit, whereby further forward movement of the leg 16 acts to lift the sucker arm 13. Immediately after the sheet has been withdrawn, the lever 16, 18 is rocked in the opposite direction to return the sucker to its initial position.

The invention is illustrated as applied to a so-called stream feeder, that is a machine for feeding sheets in lapped relation, two sheets of a stream being indicated in the drawings at S^1 and S^2.

It is to be appreciated that the movement of the sheets is arrested or slowed down as they are engaged by the suckers and that the weight of the suckers on the feed board contributes to this result.

The invention is not to be restricted to the precise details described above. For example the suckers may be held clear of the sheet until it has passed beneath them and they may then be lowered onto the sheet to grip it and to move forward with it.

Also, instead of one orifice, marked 15 in Figs. 2 and 4, in each sucker 10, there may be a plurality of smaller orifices illustrated in Figs. 5 and 6 at 45 and 46. These orifices are so arranged that as they slide off the sheet the grip is gradually diminished. Then, if the sheet should bounce back from the front guides, it would be reengaged and would be taken again to the front guides to insure correct register.

Having thus described my invention, I claim:

1. In a sheet feeder, a feed board, a sucker arm, a sucker at the forward end thereof over the feed board, means pivotally connected with the rear end of said arm for moving the sucker back and forth in the direction of sheet travel and for raising it above the sheet path while a sheet is being withdrawn from the feed board, the forward end of said sucker being adapted to rest upon the feed board during its back and forth travel and the rear end of the sucker being raised slightly above the feed board in order to admit the forward edge of a sheet to the space between the sucker and the feed board, whereby the sheet may be slowed down by suction as it closes the suction orifice and by relatively slow forward movement of the sucker.

2. In a sheet feeder, a feed board, a sucker arm, a sucker at the forward end thereof over the feed board, means pivotally connected with the rear end of said arm for moving the sucker back and forth in the direction of sheet travel and for raising it above the sheet path while a sheet is being withdrawn from the feed board, the bottom surface of said sucker being flat and being inclined upwardly toward the rear, whereby the forward end of the sucker normally rests upon the feed board and a tapered opening between the sucker and the feed board is presented to an advancing sheet, and whereby the sheet may be slowed down by suction as it closes the suction orifice and by relatively slow forward movement of the sucker.

3. In a sheet feeder, a feed board, a sucker above the feed board, the forward end of said sucker resting on the feed board and the rear end raised slightly above the feed board in order to admit the forward edge of a sheet to the space beneath the sucker, means for supporting the rear end of the sucker and moving the sucker back and forth in the direction of sheet travel, said means comprising a lever mounted to swing about a transverse axis, an arm pivotally connected at its rear end to said lever, said sucker being carried at the forward end of said arm, means for swinging said lever in timed relation with the sheet travel, and stop means on the lever and

arm for holding those parts in relatively fixed relation at the forward end of the lever movement, whereby the sucker is raised above the sheet path while the sheet is being withdrawn from the feed board.

4. In a sheet feeder, a feed board, a sheet conveyor, a sucker above the feed board, the forward end of said sucker resting on the feed board and the rear end raised slightly above the feed board, in order to admit the forward edge of a sheet to the space beneath the sucker, means for supporting the opposite end of said sucker and moving the sucker back and forth in the direction of sheet travel, said means comprising a lever mounted to swing on a transverse axis, an arm connected at one end to said lever by a transverse pivot, said sucker being carried at the free end of said arm, and means operating in timed relation with sheet travel for swinging the lever to advance the sucker at a rate slower than that of the sheet conveyor, whereby the foremost sheet is slowed down as it moves under the sucker orifice and when gripped by the sucker moves at the speed of the sucker.

5. In a sheet feeder, a feed board, a sheet conveyor, a sucker above the feed board, the forward end of said sucker resting on the feed board and the rear end raised slightly above the feed board in order to admit the forward edge of a sheet to the space beneath the sucker, means for moving the sucker back and forth in the direction of sheet travel, its forward movement being slower than that of the sheet conveyor, whereby the foremost sheet is slowed down as it moves under the sucker orifice, and when gripped by the sucker moves at the speed of the sucker, front guides against which the sheet rests as the sucker slides forward off the sheet, and means functioning in response to the final forward movement of the sucker for raising the sucker above the sheet path.

6. In a sheet feeder, a feed board, a front guide at the forward end of said feed board, a sucker arm, a sucker at the forward end thereof above the feed board movable back and forth in the direction of sheet travel, the forward end of said sucker in its rearmost position resting on the feed board and the rear end raised slightly above the feed board in order to admit the forward edge of a sheet to the space beneath the sucker and to cause the advancing sheet to close the sucker mouth, means pivotally connected with the rear end of said arm operable to move the sucker forward on the feed board in the direction of sheet travel beyond the front guide, whereby the sheet is registered, to raise the sucker after registration of the sheet and permit the sheet to be withdrawn from the feed board and thereafter to return the sucker to its rearmost position on the feed board for the reception of the next succeeding sheet.

HEADLEY TOWNSEND BACKHOUSE.