

May 5, 1964

F. A. LYON ETAL
BOOKLET FEEDING MEANS

3,131,930

Filed Dec. 22, 1961

4 Sheets-Sheet 1

FIG 1

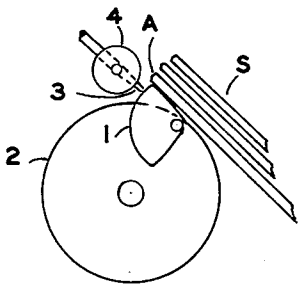


FIG 2

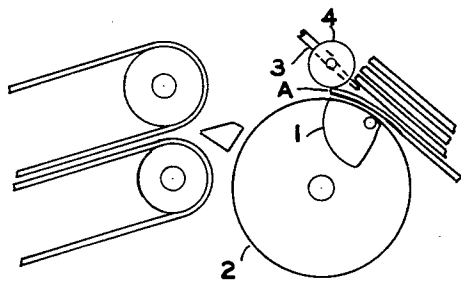
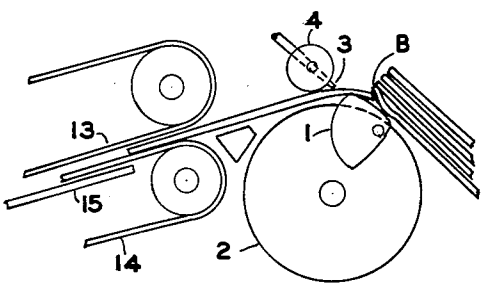


FIG 3



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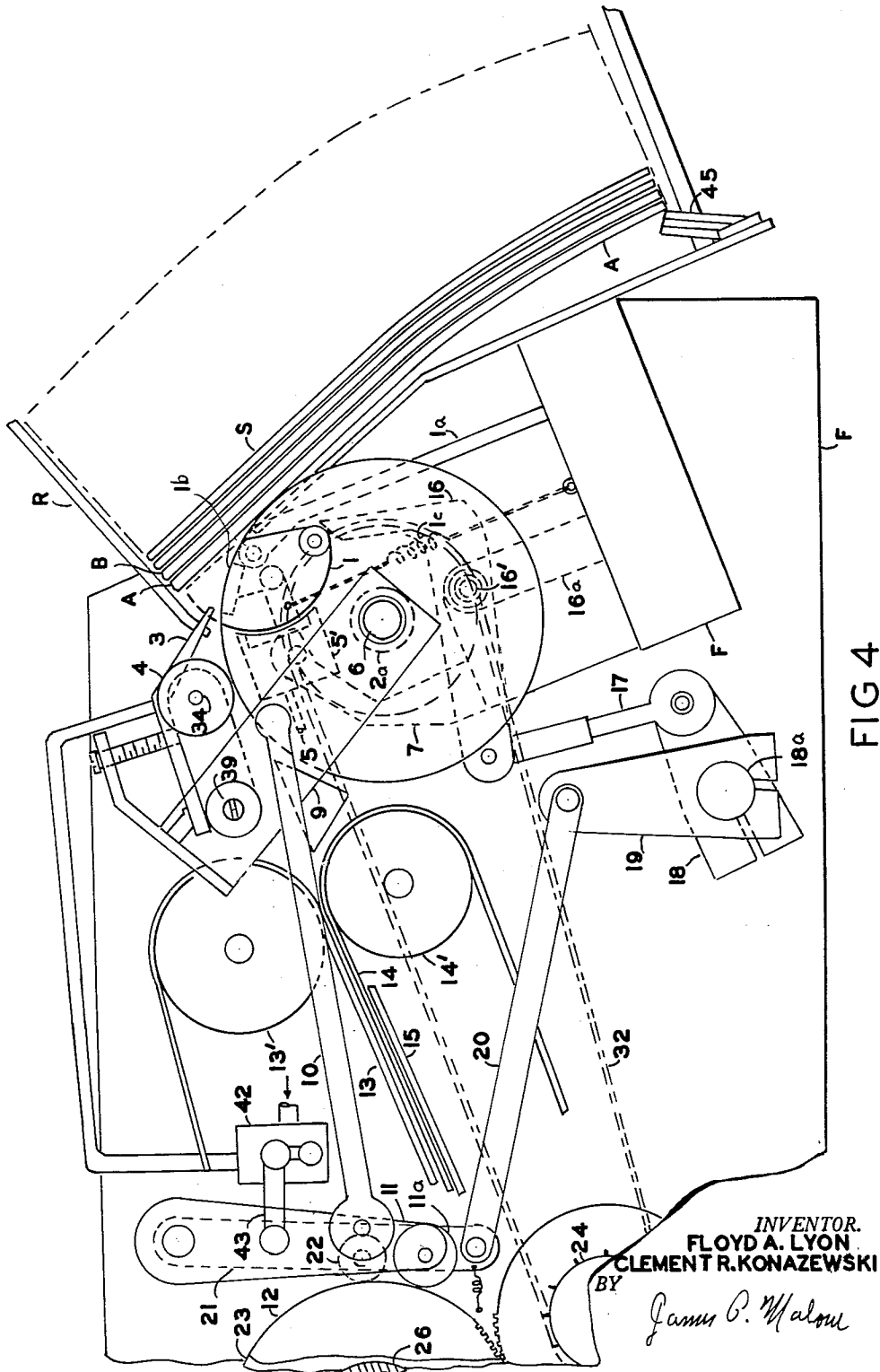
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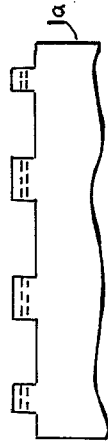
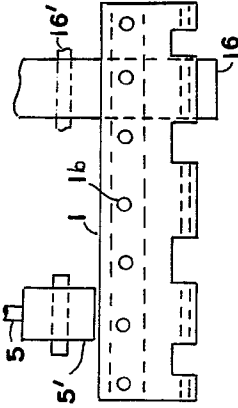
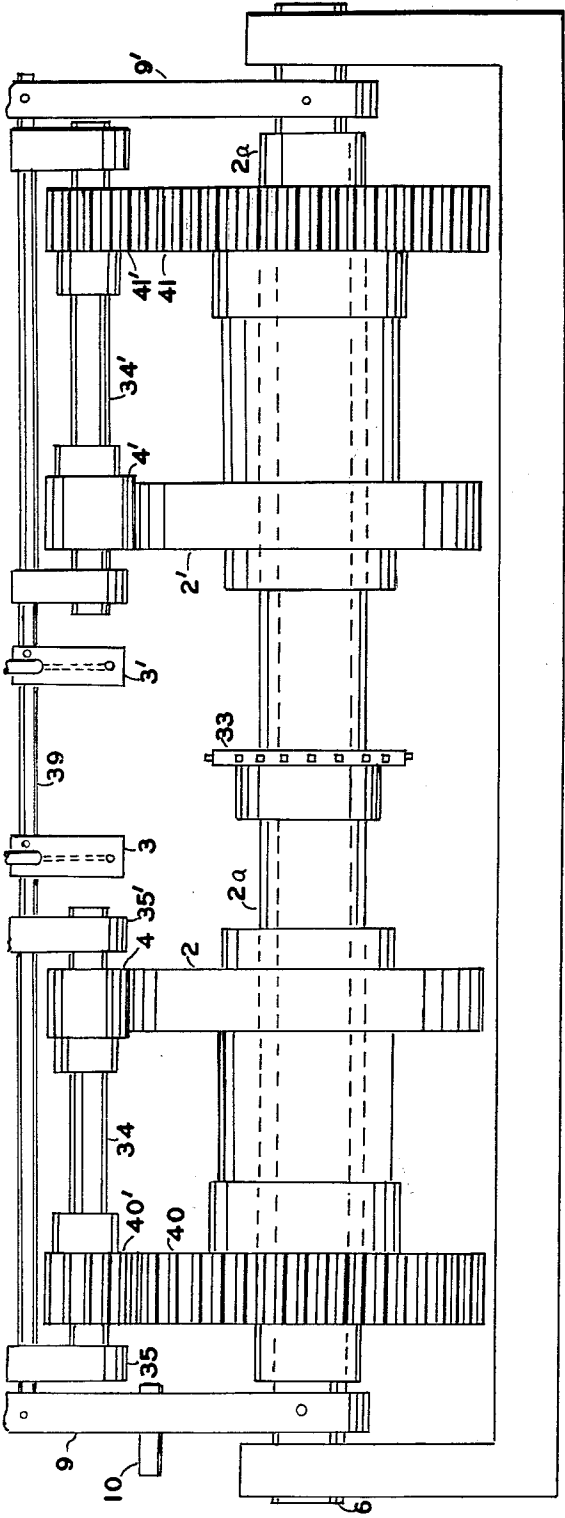


FIG 5

FIG 6

FIG 7

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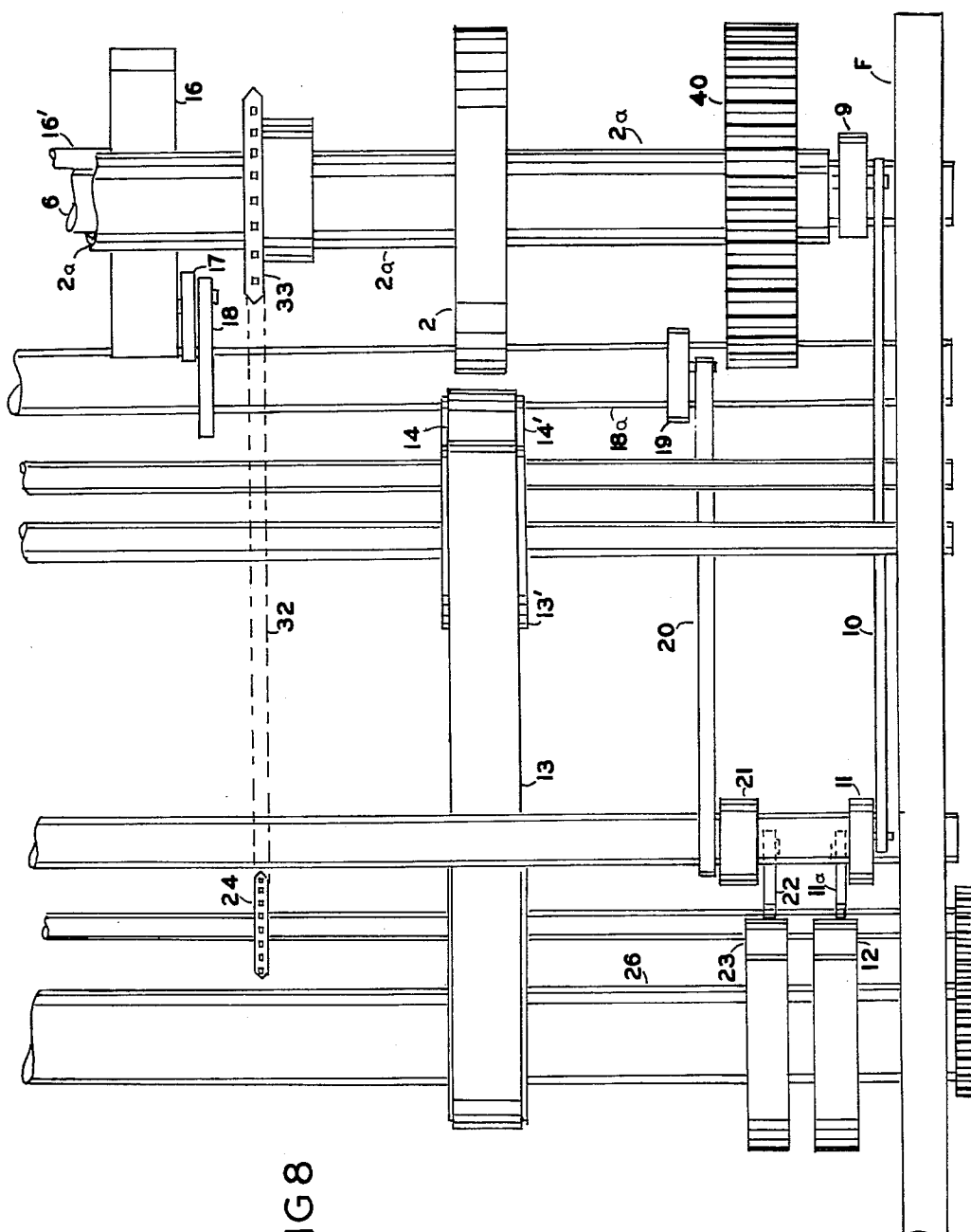
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3,131,930

BOOKLET FEEDING MEANS

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Filed Dec. 22, 1961, Ser. No. 161,629
2 Claims. (Cl. 271-29)

This invention relates to means for feeding relatively thick booklets of sheets of stiff material.

Conventional paper feeding apparatus such as shown in my Pats. 2,704,209 and 2,770,458 show means for separating relatively thin sheets of paper from a stack by means of a curved vacuum sucker which operates to separate the leading edge of the closest sheet from the stack so that the leading edge may be gripped in suitable takeaway members and removed from the stack. That type paper separating means is not suitable for feeding booklets having a number of pages or stiff sheets of material as these booklets or sheets have a great deal more stiffness than single sheets of paper so that the vacuum in the curved suction member is not sufficient to bend them enough so that the desired separation and removal can be effected.

The present invention is an improvement of that type device, having a pivotally mounted sucker member which is adapted to oscillate into contact with the leading edge of the closest booklet and then to draw that leading edge into contact with a lower takeaway roller. A reciprocating upper roller then moves in to grip the leading folded edge between itself and the lower takeaway roller. A mechanical pick separator and air blast nozzle are mounted on the reciprocating upper roller to assist in separating the leading edge of the closest booklet from the stack.

Means are also provided to prevent relative movement of the pages of the booklet being removed, that is, as the booklets are being fed with the folded edge as the leading edge and since a force is first applied to the closest page there is a tendency for that closest page to move relative to the other pages, forming an undesirable loop. Suitable frictional drag means are provided to bear against the trailing edge of the closest page to minimize this condition.

As the lowest booklet is removed from the stack by the takeaway rollers, the oscillating sucker is cam actuated so that it rises under the trailing edge of the booklet being removed and into a vacuum sucking relationship with the next booklet with a continuous progressive sucking action so that the vacuum sucker is not valved but provides a continuous vacuum which is unbroken between successive booklets. This feature greatly enhances the speed potential of the device.

Accordingly, a principal object of the invention is to provide new and improved booklet separating and feeding means.

Another object of the invention is to provide new and improved means for feeding booklets or stiff sheets of material from a stack.

Another object of the invention is to provide new and improved means for separating and feeding booklets or stiff sheets of material from a stack, comprising a pivotally mounted sucker member which is adapted to attract the leading edge of the closest booklet into frictional contact with takeaway roller means.

Another object of the invention is to provide new and improved means for feeding booklets from a stack, comprising a rack for holding a stack of booklets, means to separate the leading edge of the closest booklet of said stack, comprising a pivotally mounted oscillating continuous vacuum sucker, reciprocating takeaway roller means which are actuated in synchronized relation thereto, and a valved air blast for assisting the separation of the

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booklet from the stack by forcing air under pressure, thereby providing an air bearing surface.

Another object of the invention is to provide new and improved booklet feeding means, comprising means to separate the leading edge of a booklet from a stack including a cam operated vacuum sucker, driven roller takeaway means and means to actuate said sucker and said takeaway means to remove the booklets from the stack with an unbroken continuous vacuum on the sucker member so that as the trailing edge of the first booklet is carried across the surface of the sucker member the next leading booklet is attracted onto the sucker member with a continuous progressive sucking action.

Another object of the invention is to provide new and improved booklet feeding means comprising means to separate the leading edge of a booklet from a stack, means to remove said separated booklet from said stack and means to apply a frictional drag to the trailing edge of said booklet being removed to prevent the formation of undesirable loops in the cover of the booklet being removed.

These and other objects of the invention will be apparent from the following specification and drawings, of which—

FIGS. 1, 2 and 3 are schematic diagrams illustrating the operation of the invention;

FIG. 4 is a side view of an embodiment of the invention;

FIG. 5 is a front detail view of the embodiment of FIG. 4;

FIG. 6 is a detail view of the sucker member;

FIG. 7 is a detail view of the sucker member support; and

FIG. 8 is a plan detail view of the embodiment of FIGS. 4 and 5.

FIGS. 1, 2 and 3 are schematic diagrams illustrating the operation of the invention.

FIG. 1 shows the vacuum sucker 1 in the upper position underneath the leading edge of the closest booklet A in the stack S. Note that the surface of the sucker 1 is considerably above the surface of the lower roller 2 at this point. The reciprocating upper roller 4 is in retracted position.

FIG. 2 shows the next step wherein the vacuum sucker 1 has rotated counterclockwise to bring the underside of the booklet A into contact with the surface of the lower roller 2, thereby separating the leading edge of the closest booklet A from the stack. At the same time the air blast nozzle 3 is rotated to a position enabling it to direct an air blast into the space between the separated leading edge of the booklet A and the remainder of the stack, thereby facilitating the separation of the leading edge and providing an air bearing between the booklet being removed and the stack. The pointed nozzle of the air blast nozzle 3 also functions as a mechanical pick separator. At the same time the upper roller 4 is reciprocated to the right so that the leading edge of the booklet A is caught in the bite between the roller 4 and the lower roller 2.

FIG. 3 shows the next step wherein the booklet A is being removed by the driven rollers 2 and 4 so that the booklet is placed into contact with the driven belts 13 and 14 so that the booklet A will be moved along the stationary table 15. As the trailing edge of the booklet A being removed moves across the surface of the vacuum sucker 1, the sucker 1 is rising again and the vacuum in the sucker 1 is attracting the next booklet B with a progressive sucking action. In other words, the vacuum in the sucker 1 is not valved but is continuously covered at all times by the booklets in overlapping relation.

FIG. 4 shows a side view and FIGS. 5 and 8 show detail elevation and plan views of an embodiment of the invention. The rack R holds stack S at an angle

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to the horizontal so that a portion of the weight of the stack bears on the lowest booklet. The vacuum sucker 1 is pivotally mounted on the shaft 1' on bracket 1a and supplied with vacuum through the flexible tube 5 which is connected via connecting block 5' which is slidably connected to sucker 1. The vacuum is connected to apertures 1b in the upper surface of the member 1. Block 5' is pivotally mounted on arm 7 mounted on frame member F. Note that in the retracted position of member 1 shown, the apertured surface of the member 1 lies in the plane of the surface of the lower roller 2 which is mounted on tube 2a which is rotatably mounted on the shaft 6. The vacuum member 1 is spring loaded to this position by means of the spring 1c.

FIG. 6 shows a detail view of member 1.

FIG. 7 shows a detail view of mounting bracket 1a.

The vacuum member 1 is adapted to be oscillated up to contact the closes booklet or sheet by means of the L-shaped pusher member 16 which is pivotally mounted on the shaft 16' on bracket 16a. The oscillating pusher member 16 is actuated by the linkage comprising connecting rods 17, arms 18, 19, fixedly mounted on shaft 18a, 20, 21, cam follower 22 and cam 23 mounted on cam shaft 26 on frame F.

The reciprocating upper roller 4 is mounted on the arm 9 which is pivotally mounted about the shaft 6 and which is adapted to oscillate by means of the linkage comprising link 10, arm 11 mounting cam follower 11a and cam 12.

When the roller 4 is reciprocated to the right in FIG. 1 it engages the separated leading edge of the booklet being removed between itself and the lower roller 2 and the booklet is then passed between the takeaway belts 13 and 14 on the inclined surface or table 15. Rollers 2 and 4 have corresponding rollers 2' and 4' on the other side as shown in FIG. 5, all of which are continuously driven. Belts 13 and 14 are mounted by driven rollers 13' and 14' mounted on frame F. A corresponding set of belts are mounted on the other side.

FIGS. 5 and 8 show detail elevation and plan views of the embodiment of FIG. 4. The shaft 6 is mounted in the frame F with suitable bearings. The tube 2a is rotatably mounted on the shaft 6. The lower rollers 2 and 2' are fixedly connected to the tube 2a and are adapted to be rotated by means of a chain 32 connected to the sprocket 33 which is fixedly connected to the tube 2a. The upper rollers 4 and 4' are mounted on shafts 34, 34' which are mounted at each end by means of adjustment arms 35, 35' and 36, 36' to the shaft 39, which is fixedly mounted to arms 9, 9' which are fixedly connected to the shaft 6. As described in connection with FIG. 4 the arms 9, 9' and the upper rollers 4 and 4' are adapted to oscillate by means of the cam operated linkage described. The upper rollers are rotatably driven by means of the gears 40, 41 mounted on the tube 2a which mesh with gears 40', 41' mounted on the upper roller shafts 34, 34'.

The sucker 1 FIG. 6 is pivotally mounted on bracket 1a FIGS. 4 and 7 between the lower rollers and is in sliding contact with the vacuum supplied connection member 5'.

The drive to the sprocket 33 is provided by the chain 32 which is connected to a corresponding sprocket 24 which is geared to the driven cam shaft 26 which is connected to a conventional motor, not shown.

The air blast FIGS. 3, 3' is valved by means of a valve 42 which is connected to a source of air under pressure. The valve 42 is operated by the arm 43 which is pivotally connected to the cam operated arm 21 or if desired to a separate cam on the cam shaft 26 so that the air blast may be provided with the proper synchronized relationship to the movement of the upper roller. The airblast is directed through the nozzle 3 which is mounted on the carriage of the upper roller 4. The air blast assists in separating the booklet or sheet being re-

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moved from the stack by providing an air bearing and the nozzle itself or a suitable extension acts as a mechanical pick or separator which prevents the next booklet or sheet in the stack from being drawn along with the booklet or sheet being removed.

At the other end of the rack R which holds the stack S of sheets or booklets is mounted a stiff rubber member 45 which bears up against the lower trailing edge of the bottom booklet A. The purpose of this is to provide a drag on the lowest cover page of the booklet which prevents the leading edge of that page from moving relative to the other pages and curling up in a lump adjacent the leading edge of the booklet. The weight of the stack on the trailing edge of the closest booklet presses the trailing edge of the closest booklet into a frictional contact with the rubber drag member 45.

Many modifications may be made by those who desire to practice the invention without departing from the scope thereof which is defined by the following claims.

We claim:

1. Means for feeding booklets from a stack comprising: a rack for holding a stack of booklets, means to separate the leading edge of the closest booklet from said stack, comprising a pivotally mounted curved continuous vacuum sucker adapted to grip said booklet close to its leading edge, a pair of continuously driven lower feed rollers mounted on either side of said sucker, the surface of said curved vacuum sucker lying in the surface plane of said lower rollers in its retracted position, means to oscillate said sucker to grip said leading edge and bring said leading edge into contact with said lower rollers, and upper roller means adapted to reciprocate into a position above said lower rollers to grip said leading edge between said upper and lower rollers, said sucker having continuous progressive sucking action on successive booklets, including—
 - means to synchronize the oscillation of said sucker and said upper rollers so that said sucker rises under the trailing edge of a booklet being removed by said upper and lower rollers to apply an unbroken continuous vacuum to the leading edge of the next succeeding booklet.
2. Means for feeding booklets from a stack comprising a rack for holding a stack of booklets, means to separate the leading edge of the closest booklet from said stack, comprising a pivotally mounted curved vacuum sucker, a pair of continuously driven lower feed rollers mounted on either side of said sucker, the surface of said curved vacuum sucker lying in the surface plane of said lower rollers in its retracted position, means to oscillate said sucker to grip said leading edge and bring said leading edge into contact with said lower rollers, and upper roller means adapted to reciprocate into a position above said lower rollers to grip said leading edge between said upper and lower rollers, and means to prevent the leading edge of the lower cover sheet of said booklet from moving and curling comprising a stiff rubber finger frictional drag means contacting the trailing edge of said lower cover sheet.

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