

Aug. 11, 1959

A. BÜTTNER

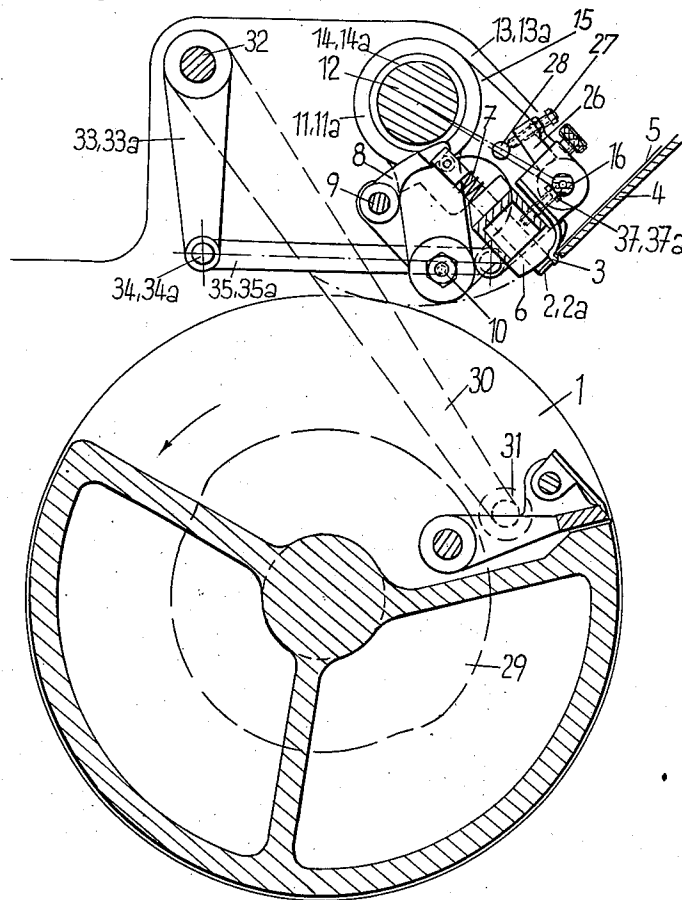
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SHEET FEEDING MECHANISM FOR SHEET HANDLING APPARATUS

Filed Dec. 2, 1957

3 Sheets-Sheet 1

Fig. 1



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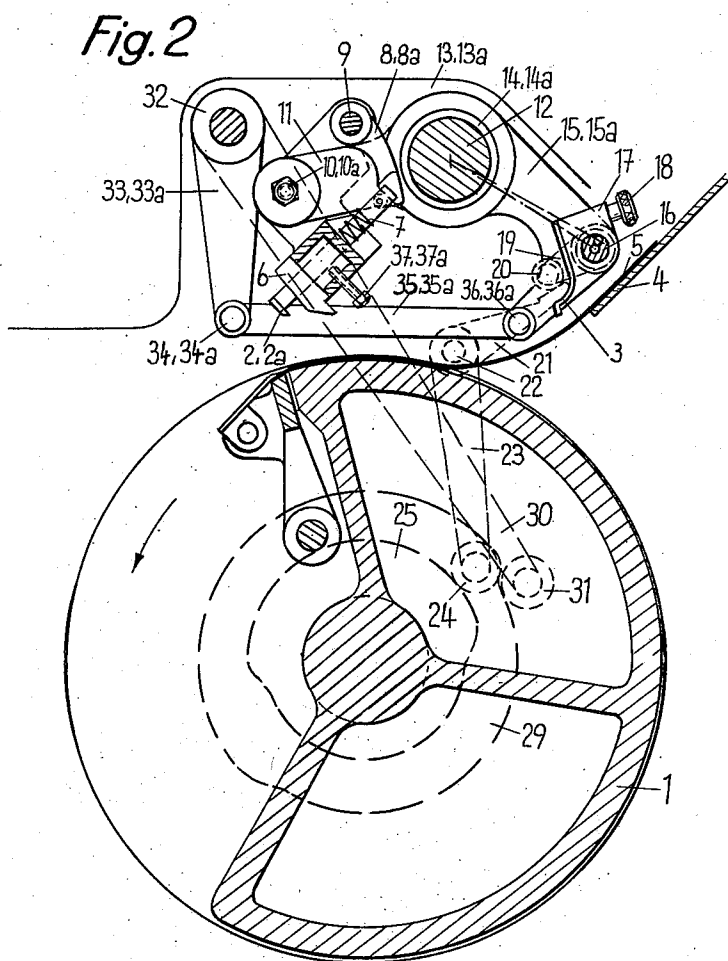
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3 Sheets-Sheet 3

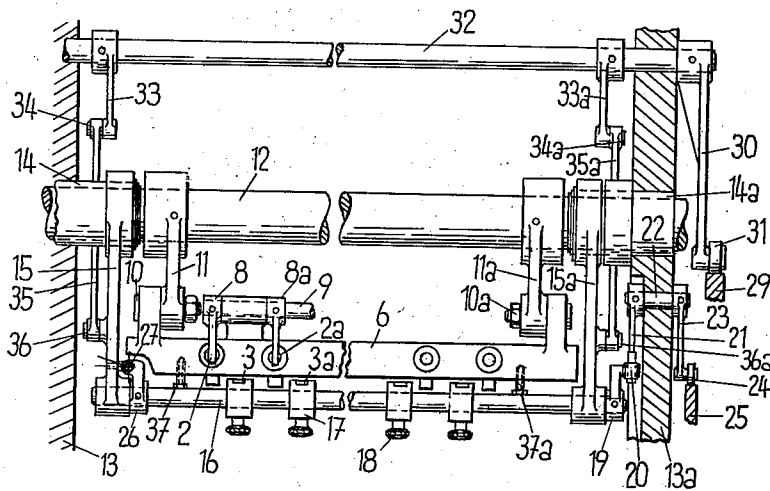


Fig. 3

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SHEET FEEDING MECHANISM FOR SHEET HANDLING APPARATUS

Artur Büttner, Heidelberg, Germany, assignor to Schnellpressenfabrik Aktiengesellschaft Heidelberg, Heidelberg, Germany, a corporation of Germany

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8 Claims. (Cl. 271—53)

This invention relates to automatic sheet-feeding apparatus or mechanisms and more particularly to a sheet-truing and positioning device for such mechanisms and particularly applicable to rotary presses and the like.

In certain sheet-handling apparatus provided with grippers it is particularly important that the sheets be properly positioned prior to being gripped by the grippers of the sheet feeding mechanism for delivery to a predetermined release point. It can readily be understood that accurate positioning of the sheets before being gripped is important, for example, in printing operations and more particularly when color printing so that the sheets are accurately positioned on the impression cylinder of the printing press by the grippers.

In sheet-feeding apparatus of the type employing conveyor rollers or conveyor belts for delivering the sheets up against feed guide stops, of the feeding apparatus, the sheets are always carried positively up against the guide stops so that the sheets are substantially always accurately positioned or trued. However, in sheet-feeding mechanisms employing grippers the sheets are taken off the stack by means of suction apparatus and delivered successively to grippers which pick up the sheet at a feed board and transport it to a predetermined point where it is released, as for example, on an impression cylinder. In sheet feeding mechanisms of the latter type, using grippers, the possibility exists that a sheet may not be brought quite up to the feed guide stops. This may occur, for example, if the sheet on top of the pile is to be separated therefrom by suction devices, for delivery to the feed board, is set back from the front edge of the pile.

It has already been proposed, in the case of machines which operate with sheet feeding devices of this type, to connect the feed guide stops or front feed register lays directly to the oscillating front grippers and to allow the grippers to execute together with the feed guide stops, a slight backward movement on the feed board, i.e. a movement contrary to that of the direction of feed of the succeeding sheet, in order that the sheet being fed may be laid positively against the front feed guide stops and be aligned and kept trued-up.

During this slight backward displacement of the sheet, which is a movement of some 3 to 5 mm., the sheet is also simultaneously straightened laterally by the side lays, so that when the backward movement of the front grippers is completed, the sheet is correctly aligned and is kept adjusted before the front grippers close and subsequently convey it out of its rest position to the rotating impression cylinder or the like.

The arrangement of the feed markers or front feed register lays directly operative by the front grippers, however, has the disadvantage that the front feed register lays cannot be made use of during the operation of the machine. Moreover, the oscillating movement of the front grippers is unfavorably affected by the increased stationary period on the feed board.

It is a principal object of the present invention to

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eliminate the disadvantages of the known gripper type sheet feeding mechanisms.

Another object is to provide a sheet feeding mechanism wherein a sheet can be fed to the guide stops while the grippers are independently transporting a sheet to a predetermined point, as for example, to an impression cylinder of a printing press thereby increasing the output of the machine.

A feature of the sheet feeding mechanism according to the present invention is that the front feed register lays are operated separately from the front grippers. These feed markers or lays are preferably suitably suspended so that they swing pendulum-like about a shaft. For this purpose, the pivotal axes of the front grippers are advantageously used as the suspension shaft, about which the feed register lays oscillate, and on which they are arranged so that they move independently of the grippers. The front feed register lays are conveniently actuated by a rocking lever system which is displaceable by a cam mounted on the shaft of an impression cylinder, while at the end of the backward movement in the direction of the succeeding sheet, the movement of the front feed lays may be derived from the movement of the front grippers and may be synchronized with the latter. Conveniently, the front feed lays may be moved by stops adjustably arranged on the front grippers, and by which the front feed lays are taken along at the end of the grippers' movement.

The feed guide stops, according to the invention are disposed against the feed board and carry out their swinging movement generally independently of the movement of the front grippers. During the time when a sheet is being conveyed by the front grippers, the following sheet may already be fed to the feed guide lays, which then carry out the backward movement counter to the direction of feed.

Other objects, features and advantages of the invention will be understood from the following description and claims in conjunction with the accompanying drawing which illustrates by way of example a preferred embodiment of the sheet feeding mechanism, and in which

Fig. 1 is a sectional side elevation view of a sheet feeding apparatus according to the invention and illustrates an impression cylinder with the associated feed register lays and oscillating front grippers of the sheet feeding mechanism in position against the feed board;

Fig. 2 is a corresponding elevation view after a sheet has been conveyed by the front grippers on to the impression cylinder, the front feed register lays being raised with respect to the feed board in order to allow passage of the sheet proceeding to the impression cylinder, and

Fig. 3 is a plan view of the front gripper arrangement and of means for pivotally suspending the front feed register lays.

While the sheet feeding mechanism according to the invention will be described with relation to a rotary cylinder printing press it will be understood that the invention is equally applicable to other sheet handling apparatus. In the drawings, the impression cylinder 1 of a printing machine rotates in the direction of the arrow.

According to Figure 1, the sheet feeding mechanism is provided with oscillating front grippers 2, 2a etc. and front feed register lays 3, 3a etc. shown as having arrived in their backward end position of their cyclical operation and are against the feed board 4. The front grippers 2, 2a have seized the leading edge of a sheet 5 resting against feed lays 3, 3a. The sheets 5 are delivered successively to the feed board from a stack of sheets by known suction means not shown. The sheets are fed in a direction toward engaging the register lays 3, 3a etc. The front grippers 2, 2a and so on are mounted spaced

longitudinally of a gripper bar 6 (Fig. 3) and are held in a normally closed position by a compression spring 7. The opening movement of the front grippers 2, 2a etc. is effected by a lever 8, which is mounted on a shaft 9. Shaft 9 is mounted on the gripper bar 6. The gripper bar is connected by means of pins 10 and 10a with the lever arms 11 and 11a, attached to a shaft 12. The shaft 12, from which the oscillating movement of the grippers is derived, is rotatably mounted at its opposite ends in the sides 13 and 13a of the frame of the machine by means of bearing bushings 14 and 14a. The oscillating movement of the front grippers is effected in known manner by means of eccentrics and levers not shown in the drawings.

A pair of levers 15 and 15a are freely and rotatably mounted on the ends of the bearing bushings 14 and 14a which project inwardly from the frame of the machine. On the ends of these levers is mounted a bar 16, which carries across the working width of the machine, at least two or more brackets 17 having adjusting devices 18 for the actual feed register lays 3, 3a etc. The bar 16 is fixedly connected at one end with a lever 19 having a roller 20 which rests on a machined face (Fig. 2) of a lever 21. The lever 21 is fixedly secured to a lever 23 carrying a roller 24. The roller 24 runs on an eccentric disc 25, which is secured to the axle journal of the impression cylinder 1.

The front feed register lays are cyclically swung up substantially against the feed board by means of the eccentric disc 25 and the levers 23, 21 and 19, in order correctly to lay or position the sheet on the feed board or feed support means 4 (Fig. 1) and are swung away from the feed board (Fig. 2) and clear of the sheets in order to allow the sheet seized by the front grippers to pass by.

A stop lever 26 attached to the end of the shaft 16, at the opposite end from the lever 19, carries a setscrew 27, which rests against a stop 28 (Figs. 1 and 3) connected with the adjacent lever 15. By means of this setscrew 27, the front edges of the feed register lays 3, 3a etc. can be set higher or lower in known manner, according to the thickness of the paper or cardboard to be handled.

The feed register lays 3, 3a etc., as soon as the sheet 5 has arrived on the feed board 4, execute a slight backward movement with respect to the feed board, in a direction toward the trailing edge of the sheets, in addition to the aforescribed pendular movement for letting through the sheet seized by the front gripper. This last mentioned movement amounts from about three to five millimeters and is for the purpose of ensuring that the front edge of the sheet 5 is correctly brought into position in the event that it is not fed up against the lays 3. The swinging movement of the whole feed register lay arrangement takes place about the shaft 12 of the front grippers, since the levers 15 and 15a are mounted on the bearing bushings 14 and 14a.

The pendular movement of the feed register lay arrangement is derived from an eccentric cam 29, which is also secured to the axle journal of the impression cylinder 1. The lifting movement of the eccentric 29 is transmitted to a shaft 32 by lever 30, which carries a roller or cam follower 31 at its end and rides on the cam surfaces as shown. The shaft 32 is rotatably mounted in the side frame portions 13 and 13a, and has secured thereto, levers 33 and 33a which are connected at their lower ends by pins 34 and 34a to guide rods 35 and 35a. The other ends of the guide rods 35 and 35a are pivotally connected by pins 36 and 36a with the levers 15 and 15a. Thus the lifting movement of the eccentric cam 29 is transmitted to the feed register lay arrangement in such a way that while a sheet is being trued up on the feed board, a pendular movement of a few millimetres about the axle 12 is imparted to the feed register lays, i.e. in a direction towards the feed board 4, i.e. toward the trail-

ing edge of the sheets. A sheet, which has been conveyed on to the feed board so that its front edge is not quite up to the feed lays, even though the feed board is inclined to the horizontal as shown, is then positively brought up against them by this backward movement of the said lays. Together with the backward movement of the feed lays the sliding movement of the sheet in the lateral direction also takes place at the same time in known manner.

A further feature of the invention consists in that the last phase of the pendular movement of the front feed register lay arrangement is derived from the movement of the front grippers, by means of two stop screws 37 and 37a (Fig. 3) which are screwed into the gripper bar 6. These stop screws engage the shaft 16 shortly before the corresponding end of the front grippers movement and the final movement of bar 6 moves shaft 16 in a backward direction so that there is joint movement of the front feed register lays and front grippers. In this final phase of the common backward swinging movement, the front grippers 2 are still open; a situation thus arises as if in this final phase of the front gripper movement the feed register lays were fixedly connected with the front grippers. As is shown in Fig. 1, the roller 31 is slightly spaced from the eccentric 29 in this final phase of the movement. The lever 31 and the parts associated therewith are consequently inoperative at this time. This is of importance where a perfect adjustment of the sheet is essential, as for example, in the case of multicolor printing. Although the front grippers and the feed lays carry out separate movements, they are, in the important end position for the truing-up of the sheet, positively coupled with one another before the front grippers close. As soon as the front grippers have closed, then, the feed lays swing up, as shown in Fig. 2, and while the sheet is transferred to the cylinder and the whole length of it passes the front edge of the feed board, the front feed register lays remain in this raised position. Before the front feed lays swing back to the feed board, the pendular movement of the whole lay arrangement has also restored to the starting position, in order that for the following sheet, the backward movement of the sheet on the feed board may be made possible.

While preferred embodiments of the invention have been illustrated and described, it will be understood that the invention is in no way limited to these embodiments and that many changes may be made within the spirit and scope of the invention as defined by the following claims.

What I claim and desire to secure by Letters Patent is:

1. In a sheet-handling apparatus having sheet-support means to receive and support sheets, means for delivering individual sheets successively to the sheet-support means, an automatic sheet-feeding mechanism comprising, in combination, a movable gripper carrier, grippers spaced longitudinally of the carrier, means for automatically, cyclically operating the carrier and grippers to grip successively individual sheets from the sheet-support means and for causing the carrier and grippers to deliver the sheets successively to a predetermined point and means for subsequently operating the grippers as they reach said predetermined point to release the gripped sheets, sheet-truing means comprising front feed register lays cyclically operable for positioning the sheets successively on the sheet-support means in a predetermined trued position and for holding the successive sheets in said true position prior to the gripping thereof by the grippers, first means for cyclically operating and moving the sheet-truing means clear of the sheets independently of the gripper carrier subsequent to the gripping of the sheets and in timed relationship with the gripper carrier operating means and for subsequently restoring the sheet-truing means to a position for positioning and holding said sheets in said trued position while said grippers are delivering the sheets to said predetermined point thereby to allow the sheets to be gripped by the grippers subsequent to the positioning thereof and while being held

in said trued position, means operably associated with said gripper carrier for moving the sheet-truing means toward the sheet-support means subsequent to the restoration thereof by said first means, independently of said first means and under control of said gripper carrier during the final phase of the gripper carrier cycle prior to the gripping of the individual sheets thereby to position the front feed register lays in exact timed relationship with the gripper carrier cycle insuring exact positioning and truing of the sheets prior to the gripping thereof by the grippers.

2. A sheet-handling apparatus according to claim 1, in which said means for delivering the sheets to the sheet-support means delivers the sheets toward a predetermined direction, and in which said front feed register lays are arranged for cooperation with the leading edge of the sheets to stop the travel of said sheets and to position said sheets in said trued position.

3. A sheet-handling apparatus according to claim 1, in which said sheet-support means is inclined relative to the horizontal and in which the sheets are delivered in a predetermined direction toward the lower end of the sheet-support means, and said front feed register lays are constructed to cooperate with the leading edge of the sheets to position said sheets in said trued position.

4. A sheet-handling apparatus according to claim 3, in which said front feed register lays are positioned to cooperate with the leading edge of the sheets to stop the sheets when received on the lower end of the sheet-support means, and including second means for advancing said lays a predetermined distance in a direction opposite to the direction the sheets move on said sheet-support means prior to the truing means including the lays being moved clear of the sheets.

5. In a rotary printing press having a rotary driven impression cylinder, a feed board, to receive and support sheets, and means for delivering individual sheets successively to the feed board, an automatic sheet feeding mechanism comprising, in combination, an oscillatable gripper carrier, grippers spaced longitudinally of the carrier, means for automatically, operating the carrier and grippers to grip successively individual sheets on the feed board and for causing the carrier and grippers to deliver the sheets successively to the impression cylinder, means for subsequently operating the grippers to release the gripped sheets once positioned on the impression

cylinder, movable sheet-truing means comprising front feed register lays cyclically operable for positioning the sheets successively on the feed board in a predetermined trued position prior to the gripping thereof by the grippers and for holding the sheets in said trued position, first means for cyclically operating and moving the front feed register lays approximately between a first sheet-engaging operative position for positioning and truing the individual sheets and a second operative position clear of the sheets subsequent to the gripping of the sheets and in timed relationship with the gripper carrier operating means thereby to allow the sheets to be gripped by the grippers subsequent to the positioning of said sheets and while being held in said trued position, and second means for moving the front feed register lays in a direction toward the trailing edge of the sheets prior to the gripping of the sheets by the grippers and independently of the gripper carrier and the first means, thereby to position the register lays substantially at said first position.

6. In a rotary printing press an automatic sheet-feeding mechanism according to claim 5, in which said impression cylinder is provided with means for actuating said second means in timed relationship with rotation of said impression cylinder.

7. In a rotary printing press an automatic sheet-feeding mechanism according to claim 6, including means disposed on said gripper carrier for operating the front feed register lays independently of said second means under control of the gripper carrier during the final phase of the gripper carrier operation cycle and for moving the front feed register lays a predetermined distance toward the trailing edge of the sheets thereby to position the front feed register lays exactly in said first position in exact timed relationship with the gripper carrier insuring exact positioning and truing of the sheets prior to the gripping thereof by the grippers.

8. In a rotary printing press an automatic sheet-feeding mechanism according to claim 5, in which said impression cylinder is provided with means for actuating said first means in timed relationship with rotation of said impression cylinder.

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