Nov. 11, 1969 W. KOCH ET AL 3,477,710

SHEET DELIVERY MECHANISM FOR SHEET-PROCESSING MACHINES, PARTICULARLY PRINTING PRESSES

Filed Aug. 3, 1967 3 Sheets-Sheet 1

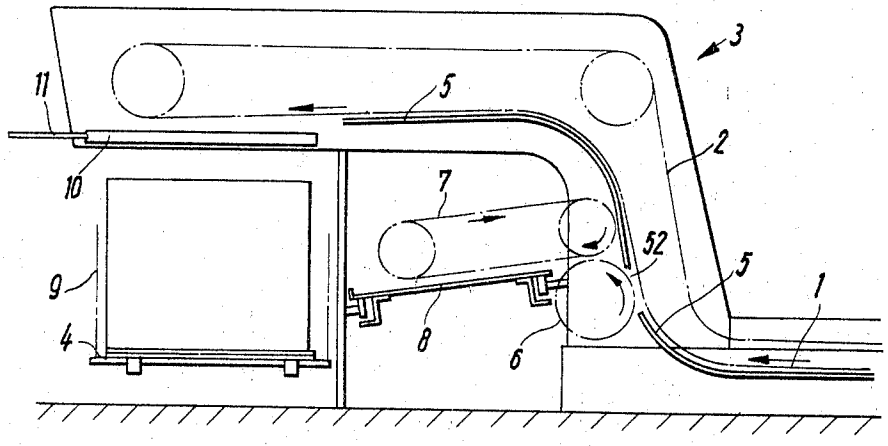


Fig. 1

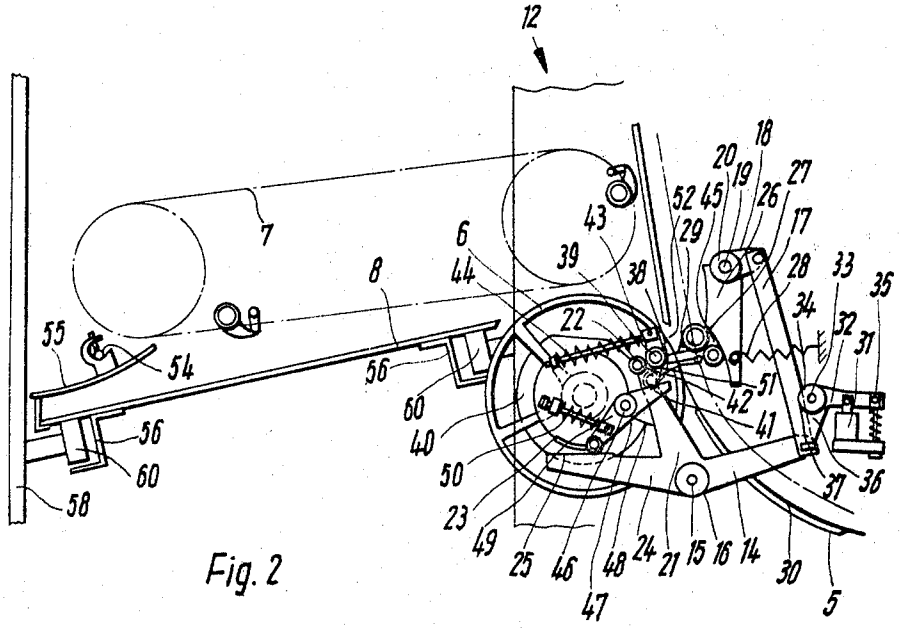


Fig. 2

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Filed Aug. 3, 1967 3 Sheets-Sheet 2

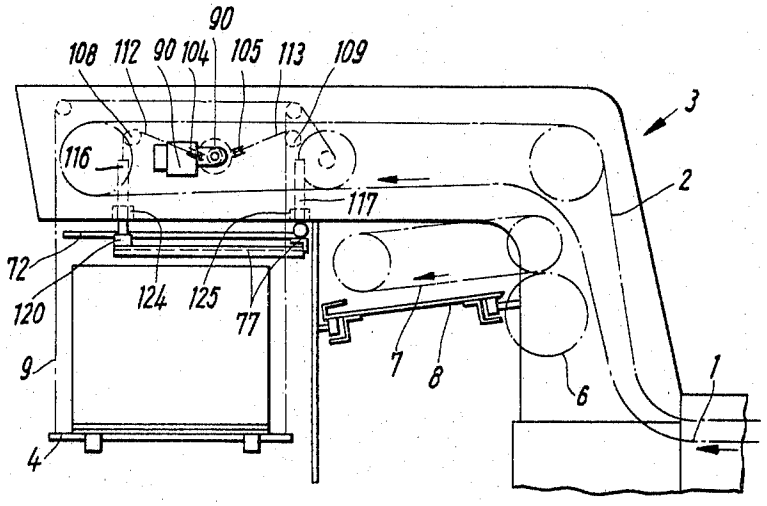


Fig. 3

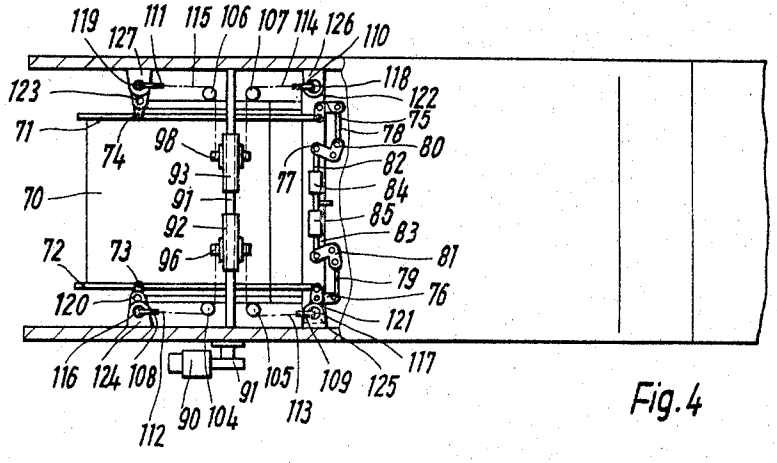


Fig. 4

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SHEET DELIVERY MECHANISM FOR SHEET-PROCESSING MACHINES, PARTICULARLY PRINTING PRESSES

Filed Aug. 3, 1967 3 Sheets-Sheet 3

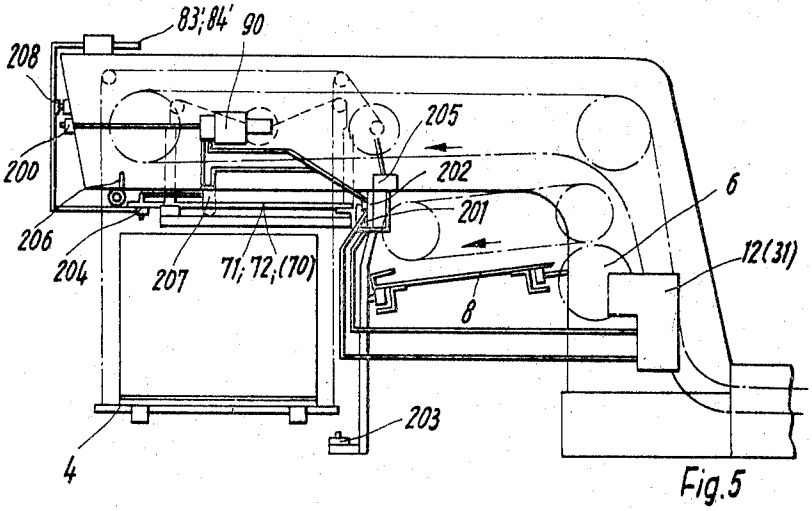


Fig.5

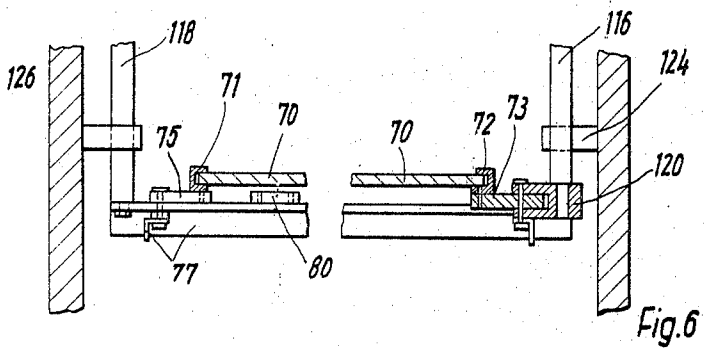


Fig.6

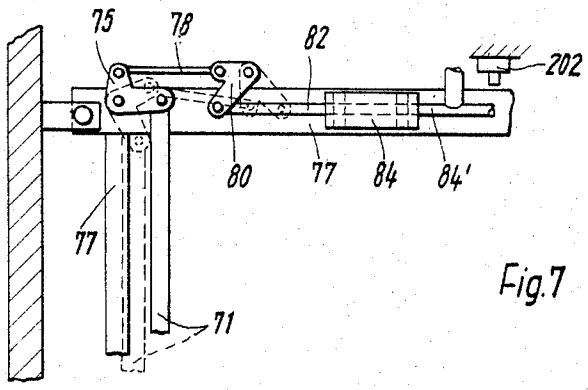


Fig.7

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United States Patent Office 3,477,710
Patented Nov. 11, 1969

3,477,710

SHEET DELIVERY MECHANISM FOR SHEET-PROCESSING MACHINES, PARTICULARLY PRINTING PRESSES

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Filed Aug. 3, 1967, Ser. No. 658,189
Claims priority, application Germany, Aug. 12, 1966, R 43,905
Int. Cl. B65h 29/58
U.S. Cl. 271—64 11 Claims

ABSTRACT OF THE DISCLOSURE

A sheet delivering device for a sheet processing machine such as a printing press has a first conveyor for delivering sheets to a first sheet stack table and a second conveyor for delivering sheets to a second sheet stack table. A selectively operably diverter serves to divert sheets travelling on the first conveyor to the second conveyor. The device also includes an auxiliary table associated with the first table for selectively feeding sheets to the auxiliary table via the first conveyor.

The invention relates to a sheet delivery mechanism for sheet-processing machines, particularly printing presses, to which sheets are supplied, from the machine, by means of an endless chain conveyor, and which comprises a device for the selective laying down of the sheets on a second pile.

The purpose of such a sheet deliverer is as continuous a delivery as possible of the printed sheets coming from the printing press. In modern high-speed printing presses, and particularly during the processing of thick cardboard, a change of piles is necessary at very short intervals of time so that with sheet deliverers which do not work continuously and with which the machine has to be stopped during the pile change, considerable standstill times are inevitable. Furthermore, it should be possible to take out a proof sheet, undamaged and without impairing the printing ink, in as simple a manner as possible, even during operation. Furthermore, by laying down sheets on two piles alternately, the printing ink on the sheets should be protected and setting off prevented, insofar as there is a longer time available for the ink to dry off, that is to say the sheets are pressed less quickly by sheets piled on top of them.

A sheet deliverer is known (German Patent 759,611) wherein two piles are provided, one above the other, and wherein the endless chain conveyor conveying the sheets is taken first over the lower pile, then below the upper pile, back towards the machine and, following an upward turn, back into the original conveying direction, horizontally over the upper pile and only then back to the machine. This sheet deliverer has the disadvantage that its piles have to be limited in height because of the space requirements and servicing facilities. Furthermore, the sheet to be laid on the upper pile has to be deflected repeatedly and there is a risk that it may smudge the top sheet of the lower pile if no additional covering is provided. Smudging of the printing ink by the sheet guide members, which have to be provided in the returning strand below the upper pile, cannot be avoided either.

Futhermore, in a high pile deliverer (U.S. Patent No. 2,406,936) it is known to provide, immediately behind the last printing unit of a machine, below the service platform usually provided between machine and deliverer, a second pile board over which the endless chain conveyor

conveying the sheets is taken. Because of its position, however, this second pile board of the sheet delivery is only suitable for low pile heights and requires an additional device by means of which the second pile can be covered when the sheets are conveyed to the first pile. It is obvious that, if the two piles are fed alternately, this device has to meet heavy demands.

It is further known (German Patent No. 1,107,674) to provide two piles one behind the other and to take the endless chain conveyor conveying the sheets both over the first and over the second pile. This deliverer likewise needs a device by means of which the one pile can be covered while the sheets are being conveyed over this to the second pile. In order to reduce the structural length of the deliverer and in order to mitigate the forces due to gravity and oscillations which occur with high-speed machine operation and which arise because the covering means have to be swung periodically and within a very short time, from one end position to the other, the covering means were constructed in the form of two parts movable in opposite directions in a plane substantially parallel with the surface of the pile. At the same time, the length of the deliverer could be reduced as a result of the division of the covering means into two parts. Although a technically optimum solution for alternate covering of one pile thus appears to have been found, the disadvantages indicated could not be completely overcome.

The invention overcomes the disadvantages of the deliverers described above by the use of gripper means which selectively divert sheets from the normal sheet path into a path in a different direction and lay them on the second pile. Thus conveying the sheets over one of the piles is avoided, together with the associated disadvantages. At the same time, the total structural length of the delivery mechanism is reduced because the space which was taken up by the covering means which were swung aside is saved.

If sheet guide members are provided, according to the invention an aperture is provided in these which extends over the whole width of a sheet and through which the sheets are taken out. Since the sheets are taken out transversely to the normal sheet path, a narrow aperture just permitting the passage of the gripper means is sufficient and there is therefore no fear of the aperture detracting from the effect of the sheet guide members.

A particularly advantageous example of an embodiment of the invention results from the fact that, in a high pile deliverer, the sheets are taken out of the normal sheet path in the rising section thereof. In this case there is sufficient height available for a complete second pile.

In a further embodiment of the invention, a second chain conveyor is provided which is connected in selectively and takes over sheets from the first chain conveyor, brings them over the second pile and lays them down there.

A particularly appropriate example of an embodiment of the invention results from the use of a drum which is mounted between the first and second chain conveyors and which, being connected in selectively, takes over sheets from the first chain conveyor and transfers them to the second chain conveyor. If this drum is provided, the second chain conveyor conveying the sheets can be taken back above the pile.

A further embodiment of the invention consists in that the board for the second pile is inclined at an acute angle to the horizontal. This ensures that the sheets delivered will slide through the force of gravity towards the end stop provided on the board and so be aligned.

In a further embodiment of the invention, means are preferably provided to control a selective extraction of the sheets from the normal sheet path. Servicing expen-

diture can be reduced to a minimum by such a control even with sheet delivery which does not alternate periodically between the two piles.

One embodiment of the invention consists in the provision of an auxiliary delivery board, known per se, above the first pile. Such an auxiliary delivery board is preferably introduced above the first pile while the sheets are briefly being laid on the second pile, and can then serve as a delivery station for the time during which the first pile is being emptied. Thus alternate sheet deilvery is also possible during the pile change.

According to the invention, drive and conveyor means are further provided for an upward and downward movement of the auxiliary delivery board which is independent of the movement of the first pile. A possible downward control of the auxiliary delivery board independently of the main pile increases its pile capacity and so lengthens the period of time available for the pile change, an advantage which is particularly appreciated during the processing of thick cardboard. The sensing device which controls the downward movement of the pile and which is normally provided is preferably adapted for switching over both for the main pile and for the auxiliary pile. Switching over of the sensing members and the course of the individual pile-changing operations such as the downward and upward travel of the main pile, may be effected manually or automatically. Thus a limit switch which was actuated by the inserted auxiliary delivery board and which closes the circuit for the downward movement of the main pile would considerably accelerate the course of the pile change. Automation could be introduced in the same manner for the other operations without great expense.

The sensing device which can be switched over for the control of the downward movement of the main or auxiliary pile respectively, works in known manner so that the surface of the pile in question remains at a prescribed height. Whereas the downward control of the pile in question depends in known manner on the sheet thickness and the machine speed, the downward and upward travel of the main pile during the pile change takes place at a constant speed which is preferably higher.

According to the invention, a power-operated lever arrangement is provided whereby the supports for the auxiliary delivery board are brought into and out of the operational position. Thus it is possible to deposit the auxiliary delivery board, together with the pile lying thereon, on the board for the main pile. The power may be transmitted to the lever arrangement by means of pneumatic or hydraulic cylinders or by hand.

Embodiments of the invention are illustrated diagrammatically in the drawing in which:

FIGURE 1 shows the side view of a sheet delivery;

FIGURE 2 shows an enlarged detail of the sheet delivery of FIGURE 1;

FIGURE 3 shows the side view of a sheet delivery with an auxiliary delivery board, the height of which can be controlled;

FIGURE 4 shows a plan view of a sheet delivery according to FIGURE 3;

FIGURE 5 shows a side view of the sheet delivery with switch contacts necessary for the automatic pile change;

FIGURE 6 shows an enlarged detail on the line VI—VI in FIGURE 4; and

FIGURE 7 shows a plan view of FIGURE 6.

The lower strand **1** of an endless chain conveyor **2** of conventional construction conveys the sheets in the direction of the arrows from the last printing unit of the machine, not illustrated, to the sheet delivery station **3**. The sheets are selectively either delivered above the pile board or stack table **4**, in which case they are guided continuously by rods **5** during the conveying, or taken over by the drum **6**, transferred to a second endless chain conveyor **7** and finally delivered above the pile board or stack table **8**.

The pile board **4** is suspended from conveyor chains **9** and is controlled downwards according to the height of the piled up sheets by means, not illustrated, of conventional construction, in the course of its feeding. Guide rail **10**, into which a comb **11** can be inserted and which serves as an auxiliary delivery board, is mounted above the pile board **4**.

The selective tatking over of sheets by the drum **6** is effected by means of the control **12** illustrated in FIGURE 2. One arm **14** of the three-armed lever **16**, which is mounted for pivoting about the fixed point **15**, is hingedly connected, through a link **17** to the one arm **18** of a two-armed lever **20** which is mounted for pivoting about the fixed point **19**. The second arm **21** of the three-armed lever **16** is constructed in the form of a roller lever, the roller **22** of which rides on a camplate **23** rotating in synchronism with the drum **6**, as a result of which a periodic rocking motion is imparted to the lever **16** in such a manner that the cam **25** mounted on the third arm **24** of the lever **16** and the cam **27** mounted on the second arm **26** of the lever **20**, the functions of which have still to be explained, are periodically swung into and out of action. Lifting of the roller **22** from the camplate **23** is prevented by a tension spring **28** which acts on the second arm **26** of the lever **20** and acts on the lever **16** through the link **17**. The sheets **30** grasped at their front end by grippers **29** are conveyed, as described, along the sheet guide rods **5** in the direction of the arrows by means of chain conveyor **2**. If one or a plurality of sheets is to be removed from the normal sheet path by the drum **6**, a pull magnet **31** is energized which acts on one arm **32** of a two-armed lever **34** mounted for pivoting about the fixed point **33**. A compression spring **35** acts on the same lever arm, acting in the opposite direction. The second arm **36** of the lever **34** is constructed in the form of a pawl and, on actuation of the pull magnet **31**, it pivots in clockwise direction as a result of which the pawl enters the path of a projection **37** provided on the lever arm **14** and so locks the rocking motion of the levers **16** and **20** in the position shown in FIGURE 2.

A plurality of grippers **38** is mounted on a gripper shaft **39** which is mounted in the end walls of the drum. Said grippers shaft is turned in accordance with the outline of the stationary cam **40** which is secured to the delivery frame and on which runs the roller **41** of the two-armed roller lever **42** pinned to the gripper shaft, and the grippers **38** are thus opened and closed respectively. The necessary contact pressure of the roller **41** on the cam **40** is assured by a compression spring **44** acting on the second arm **43** of the lever **42**. The chain grippers **29** associated with the chain conveyor **2** are closed by means of a spring not illustrated and opened by means of a roller lever **45** under the action of the swing-in cam **27** in a similiar manner.

A two-armed lever **47** is pivotally mounted on a pin **46** which is fixed in the drum **6**. One arm of this lever is constructed in the form of a pawl **48** and the other arm in the form of a roller lever **49**. Said lever is pivoted in counterclockwise direction by means of a compression spring member **50**, the spring travel of which is limited, in such a manner that when the grippers **38** are opened the shoulder **51** provided on the gripper shaft **39** bears against the pawl **48** and then prevents closing of the grippers **38**. The grippers remain held in this open position so long as no sheet is to be taken over by the drum **6**. The cam **23** causing the rocking motions of the levers **16** and **20** is therefore adapted in such a manner that the cam **25** controlling the pawl **48** and the cam **27** controlling the opening of the chain grippers **29** are out of engagement at the moment when the transfer of a sheet would take place. Only through actuation of the magnet **31** and said locking of said levers is the pawl **48** disengaged through the action of the cam **25**. Thus closing of the grippers **38** can take place by spring force while shortly afterwards the grippers **29** are opened through

the action of the cam **27**. The sheet now grasped by the grippers **38** is taken out of the normal path through the aperture **52** in the sheet guide rods **5** and, after being transferred to the second chain conveyor **7**, is laid on the pile board **8**, in which case the sheets slide against the end stop **53** secured to the pile board and are so aligned. A sheet-metal guide **55** mounted for pivoting about a shaft **54** prevents the sheets from overshooting beyond said end stop. The pile board **8** comprises, at its underside, guide rails **56** in which there run rollers **60** mounted fixed in the delivery frame **58** so that it can easily be pulled in and out respectively.

The embodiment illustrated in FIGURES 3 and 4 differs by an auxiliary delivery board **70**, the height of which can be controlled, above the pile board **4**. The auxiliary delivery board can be inserted into U-shaped guide rails **71, 72** which are hingedly connected, through single-armed levers **73, 74** and two-armed levers **75, 76** to a frame **77** formed from bars. The two-armed levers **75, 76** are connected, through coupling members **78, 79**, to further two-armed levers **80, 81** on which the pistons **82, 83** of pneumatic or hydraulic cylinders **84, 85** act, as shown, in such a manner that said levers are pivoted and so the guide rails **71, 72** are parted. Thus the support is removed from the auxiliary delivery board **70** and it can be taken over, together with the pile resting thereon, by the raised, empty pile board **4**. A reversible geared motor **90** is coupled to a shaft **91** which is mounted in the delivery frame and to which the sleeves **92** and **93** are pinned, one sleeve **92** being provided at its circumference with a right-hand thread and the other sleeve **93** with a left-hand thread so that the holding members **96, 98** which are provided with corresponding female threads and secured against rotation, are displaced along the shaft when the shaft **91** rotates. The draw cables **112, 113, 114, 115** which are secured to the holding members **96, 98** and guided over the guide pulleys **104** to **111**, are connected to rods **116, 117, 118, 119** which in turn are rigidly connected to the frame **77** at the projecting parts **120, 121, 122, 123** thereof. Thus the conversion of the rotary motion of the motor **70** into a raising or lowering movement of the auxiliary delivery board **70** is achieved. Lugs **124, 125, 126, 127** render the guiding of said rods possible, as a result of which rocking of the auxiliary delivery board is prevented.

An automatic pile change may take place as follows for example:

Through actuation of the pistons **82, 83** the guide rails **71, 72** for the auxiliary delivery board **70** are swung inwards and prepared to receive the auxiliary board **70**. As a result of actuation of a switch **200**, a circuit is closed for the downward drive **90** of the guide rails **71, 72**. The guide rails **70, 71** travel as far as a first limit switch **201** whereupon the guide rails **71, 72** stop, the pull magnet **31** in FIGURE 2 attracts—and so the extraction of the sheet from the normal sheet path and its delivery to the second pile board **8** is initiated—and the drive for the downward movement of the first pile board **4** is actuated. The start of the downward movement of the first pile board **4** is delayed by a time relay **205** (FIGURE 5) until the sheets present between drum **6** and the delivery at the moment of actuation have been delivered. The guide rails **71, 72** (FIGURES 6, 7) are now below the sheet stops **206** which are normally present, so that even a continuous board can be introduced as an auxiliary delivery board **70**. Through a second limit switch **202**, which is actuated by the insertion of the auxiliary delivery board, the pull magnet **31** is de-energized again, the auxiliary delivery board **70** is raised into a more favourable position for the sheet delivery and at the same time the sensing device **207**, which is normally provided and which controls the pile in a downward direction in such a manner that its surface remains substantially at the same level, is switched over to the drive **90** for the supports **71, 72** of the auxiliary delivery board. During the following time when the sheets are being delivered to the auxiliary delivery board **70**, the first pile board **4**, the downward movement of which was interrupted in the lowest position by a further limit switch **203**, can be emptied. The upward movement of the pile board **4** is initiated by a push button **208**. The guide rails **71** and **72** are swung outwardly by means of a third limit switch **204** operated by the board **4** when the same engages the auxiliary board **70** which together with the sheets thereon is then placed upon the now raised board **4**. Furthermore, the sensing device **207** for the control of the height of the surface of the pile is switched over to the downward drive for the first pile board **4** by the third limit switch **204**.

What is claimed is:

1. A sheet delivering device for a sheet-processing machine, said device comprising in combination:

a first conveyor for delivering sheets to a first station;

a second conveyor means for delivering sheets to a second station;

sheet diverting means including sheet gripping means for diverting sheets from said first conveyor to said second conveyor;

actuating means coacting with said diverting means and selectively operable to actuate the gripping means of the diverting means for gripping sheets on the first conveyor and guiding the same from the first conveyor to the second conveyor; and

stationary sheet guiding means including a slot having an outline permitting passage of sheets, said first conveyor carrying the sheets along said guiding means and across said slot and said gripping means when actuated for diversion of sheets to the second conveyor gripping sheets passing the slot through the same.

2. The device according to claim **1** wherein said sheet guiding means have an upwardly slanted portion including said slot.

3. The device according to claim **1** wherein said sheet diverting means comprise a rotary drum interposed between said first and said second conveyor in coacting relationship therewith, said gripping means when actuated directing sheets upon said drum which in turn directs the sheets upon the second conveyor.

4. The device according to claim **3** wherein said second station comprises a sheet stack table oriented at an acute angle substantially tangential with the peripheral top level of said drum.

5. The device according to claim **1** wherein said first station comprises an up and down movable first sheet stack table, drive means for moving said first table up and down, and wherein an auxiliary sheet stack table is disposed above said first table for selectively depositing sheets thereupon from the first conveyor.

6. The device according to claim **5** wherein said auxiliary table is mounted for up and down movement, and linkage means and drive means are coupled to said auxiliary table for selectively moving the same independent of a movement of the first table.

7. The device according to claim **6** wherein support means for said auxiliary table are movable into and out of supporting engagement with the same, and wherein power operable linkage means are coupled to said support means for selectively moving the same into and out of engagement with the auxiliary table.

8. The device according to claim **7** and further comprising stationarily mounted sheet stop means for arresting sheets by engagement therewith, and control circuit means including switch means for controlling said linkage means, operation of said switch means actuating said linkage means for lowering said support means into a selected position for engagement of the auxiliary table by the support means, said position of the auxiliary table being below the level of said stop means.

9. The device according to claim **8** wherein said circuit control means comprise a second switch means, the

support means in said selected position thereof operating said second switch means to actuate said sheet diverting means for diverting sheets from first conveyor to said second conveyor and also to actuate said drive means for the first table for effecting a downward movement of said table to a predetermined low position, and wherein time delay means are included in said circuit control means to delay start of the downward movement of the first table for a predetermined period of time.

10. The device according to claim **9** wherein said circuit control means include a third switch means operable by engagement wtih the first table in said selected position thereof, operation of said third switch means deactivating the sheet diverting means, activating the drive means for the support means to lift the same and with it the auxiliary table above said selected lower position, and wherein level sensing means maintain the top level of sheets stacked on said first table or on said auxiliary table substantially constant during the downward movement of the respective table by controlling the drive means for the respective table, said sensing means being switched from control of the level of the first table to control of the level of the auxiliary table by operation of said third switch means.

11. The device according to claim **10** wherein said circuit control means include fourth switch means operable by engagement with the auxiliary table during the upward movement thereof, operation of said fourth switch means activating said power driven linkage means to effect disengagement of said support means from said auxiliary table and switching said sensing means from control of the sheet level of the auxiliary table to control of the sheet level of the first table to effect control of the sheet level of the first table during the downward movement thereof.

References Cited

UNITED STATES PATENTS

2,435,881	2/1948	Faeber	271—82
2,868,141	1/1959	Griner	198—210
2,753,798	7/1956	Babst	101—232
3,347,367	10/1967	Smith	271—64

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U.S. Cl. X.R.

271—68