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2,789,709

DUPLEX TAKE-OFF TABLE

Filed Dec. 31, 1952

2 Sheets-Sheet 1

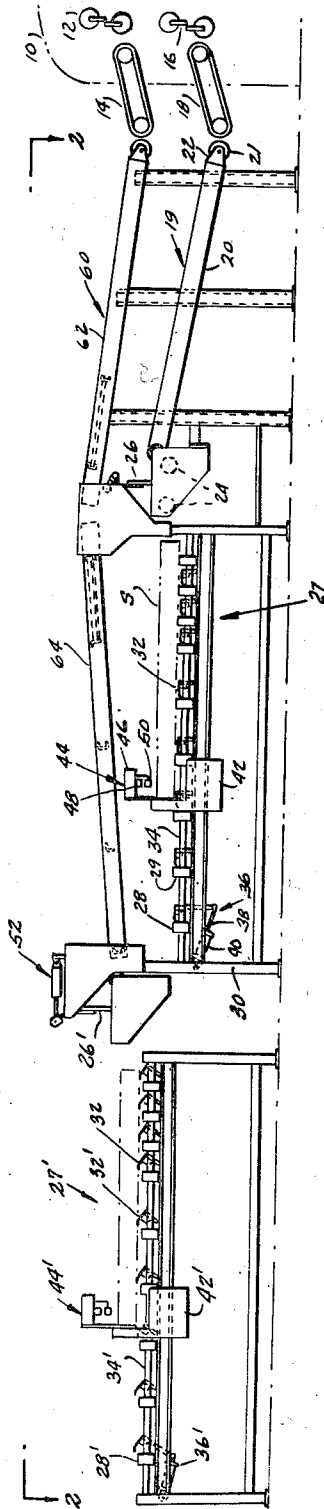


FIG. 1

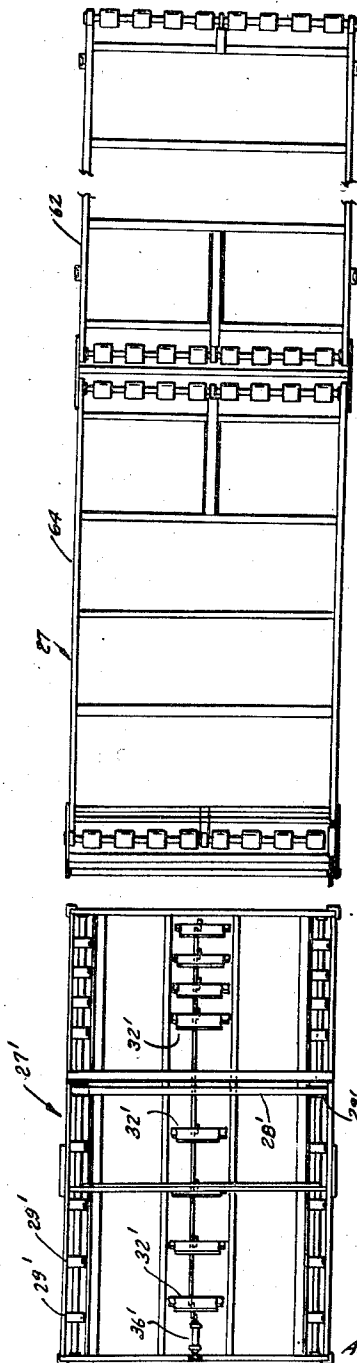


FIG. 2

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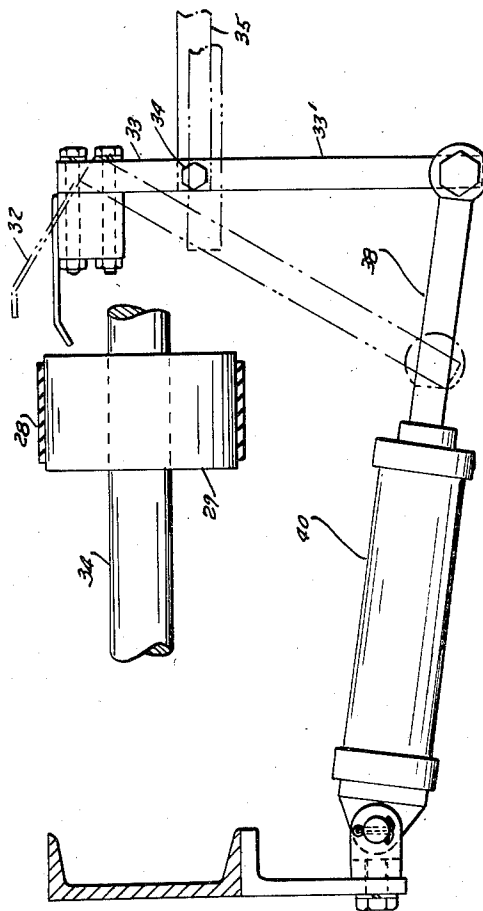
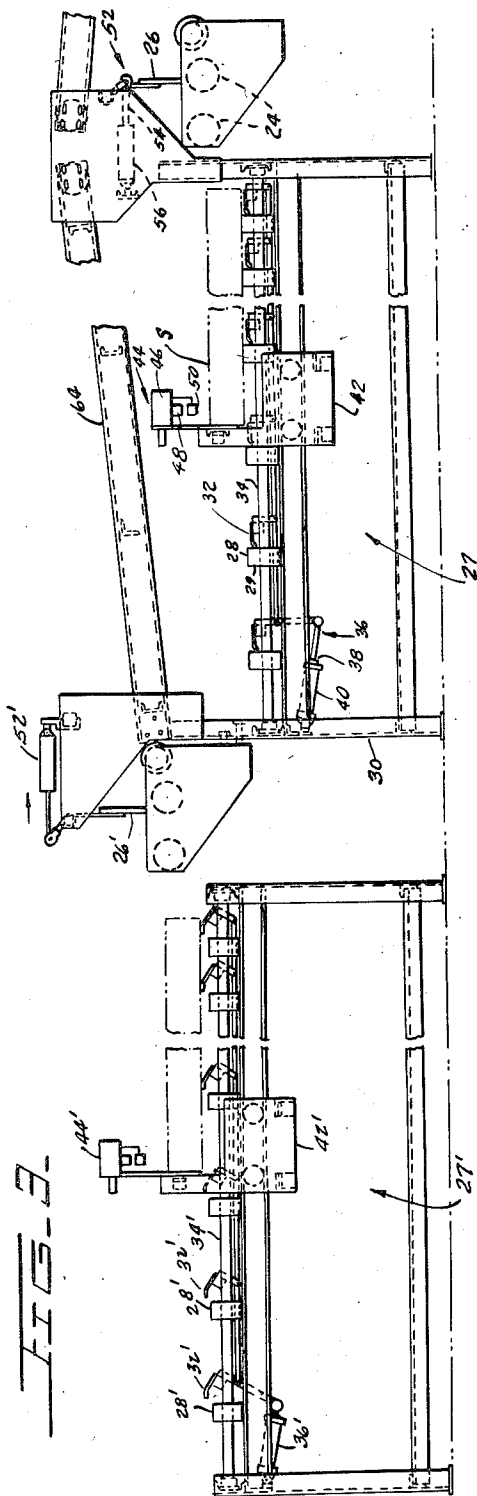
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2 Sheets-Sheet 2



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DUPLEX TAKE-OFF TABLE

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1 Claim. (Cl. 214—6)

The present invention relates to conveying machinery for receiving and stacking sheets of paper, fiber board, corrugated board and the like, commonly referred to as a take-off table, and particularly to interchangeable equipment for high-speed stacking and removal of cut sheets from paper processing equipment having single or plural outputs.

In the manufacture of relatively inflexible paper products such as double faced corrugated board, it is necessary to stack the boards in an orderly fashion prior to handling. Usually the stacking operation immediately follows the sequential feeding of the continuous corrugated board through scoring, slitting, and cutting machines. Since all of these operations are conducted at relatively high speeds, often at rates averaging 400 feet per minute, the possibility of an operator manually removing and stacking the sheets is virtually precluded. The problem of removing the sheets from the delivery path of known sheet cut-off mechanisms is rendered still more difficult since the cut sheets may vary in length from 30 inches up to 180 inches.

Accordingly, it is an object of the present invention to provide a novel automatic sheet stacking and conveying arrangement capable of functioning at the high operating speeds prevalent in the mass production of various paper products, especially corrugated boards.

Another consideration of prime importance is the provision of take-off arrangements which may be readily adapted for receiving, stacking, and removing the sheets from mechanisms alternately operated to yield single or plural outputs. Illustrative of this problem is the production of either single or double faced corrugated board where it is not uncommon to process corrugated sheet stock of a width from four to five times the width of the desired final board. In this type of operation, the corrugated stock is slitted longitudinally and passed through a duplex cutting machine, including separate duplex cutting units arranged to coact simultaneously on different portions of the sheet stock to deliver different widths and lengths of cut board.

Therefore, a further aspect of the present invention is to provide sheet stacking and conveying mechanisms adapted to cooperate with a sheet cut-off machine of the type including either single or duplex cutter units.

As a further feature of the present invention, it is contemplated to provide a number of conveying and stacking units which may be interrelated and interchanged in accordance with the number and location of the output mechanisms of associated feeding equipment.

A still further object of the present invention is to provide sheet stacking and conveying mechanisms permitting several workers to operate in a relatively close area for removing the outputs of single, dual, or plural cutting machines.

The above and still further objects, advantages and features of the present invention will become apparent by reference to the following detailed description of an illus-

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trative embodiment, when taken in conjunction with the drawings, wherein:

Figure 1 is a side elevational view diagrammatically showing sheet stacking and delivering mechanisms associated with a cutting machine having dual outputs.

Figure 2 is a top plan view of the mechanisms of Figure 1 with parts removed for the sake of clarity.

Figure 3 is an enlarged fragmentary view of the mechanisms shown in Figure 1 and illustrating certain constructional details of the present invention.

Figure 4 is an enlarged fragmentary detail, with parts broken away in section, showing the operating mechanisms for the lift-up fingers which are arranged to maintain the sheets in stacked formation prior to delivery to lateral conveying belts.

Referring now specifically to the drawings, there are shown a number of interchangeable units which are particularly adapted to be interrelated to each other for the purposes of removing the output of machines having one or more belt deliveries. The illustrative arrangements are constructed to automatically pile up stacks to predetermined heights and to periodically deliver the stacks as a unit via automatic removal mechanisms to take-off stations at which operators can lift the stacks on to suitable hand trucks or the like for storage or further processing.

In Figure 1 there is illustrated a conveying and stacking set-up particularly suitable for use in conjunction with a duplex cutting machine 10 of the type including an upper pair of knives 12 feeding a belt delivery 14 and a lower pair of knives 16 feeding a belt delivery 18. The duplex cutting machine, of known construction, operates to cut longitudinally slit sheets of stock into individual boards of required lengths, the delivery belts 14, 18 for the duplex cutting machines being arranged at different levels.

Adjacent the belt delivery 18 of the lower cutting knives 16 is a conveying unit 19 comprising an upwardly inclined conveyor 20 having side by side belts mounted on pulleys 21 journaled on housings 22. The lowermost end of the belt conveyor 20 is in position to receive cut sheets from the belt delivery 18. At its uppermost end the belt conveyor 20 is arranged to feed the cut sheets onto intermediate feed rollers 24 designated as a drop-off location. Positioned above the feed rollers 24 is the gate 26 which traverses the feed path defined by the belt conveyor 20 and is coordinated and operated in a manner to be subsequently described.

Disposed at a level below the delivery rollers 24 and traversing the feed path generally defined by the belt conveyor 20 is a lateral take-off unit 27 including a further conveyor 28 having side by side belts mounted on pulleys 29 (see Figure 4) supported on uprights 30. The conveyor 28 defines a second delivery path normal to the delivery path of the first belt conveyor 20 and functions to remove the sheet material from the general path of the output mechanisms 14, 18 of the duplex cutting machine 10. Accordingly, an operator can be located at a take-off station at the end of the belt conveyor 28 and work in an area generally out of the path of the delivery mechanisms of the cutting machine 10.

Positioned generally below the drop-off location of the belt conveyor 20 and above a stack receiving and supporting part of the belt conveyor 28 are a plurality of stack lowering fingers 32 each including an offset terminal part 32' (see Figure 4). The fingers 32 are pivotally mounted by supporting arms 33 on pins 34 extending transverse to the feed path defined by the belt conveyor 20 and along the feed path defined by the belt conveyor 28. The pivot pins 34 are interconnected by suitable linkages 34 and accordingly the fingers 32 can be rocked from an elevated or stack forming position designated by the letter S to the level of transverse belt conveyor 28. This is achieved only when the delivery of the sheets to

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the platform fingers 32 defined by the offset terminal parts 32' is momentarily interrupted. The operating mechanism 36 for rocking the fingers 32 includes a piston 38 connected to an extension 33' of an arm 33, the piston being supported in a cylinder 40 and operated by air under pressure in accordance with well understood techniques.

Since the belt conveyor 28 must accommodate sheets varying in length from 30 inches to 80 inches, produced with known cutting machines, the overall width of the belt conveyor 28 must be equal to or greater than the maximum sheet length. Additionally, a sheet stop generally designated by the numeral 42 is provided extending generally in the direction of the feed path defined by the belt conveyor 28 and adjustable toward and away from the sheet drop-off location of the belt conveyor 20. Adjustment of the stop 42 is selected so that the sheets being stacked can be readily accommodated over a stack receiving part of the belt conveyor 28 adjacent the drop-off location, the sheet being lowered under control of the fingers 32 defining the stack supporting platform.

The general method of controlling such a take-off is by means of sequence timers. These are devices that are well-known in the trade and serve to make or break selected circuits after predetermined time intervals and in a predetermined sequence. Thus, such a device would first open the gate 26. After an interval sufficient to allow the passage of a handy batch of sheets, the gate 26 would be closed. Again after a slight interval to allow the delivered stack to come to rest against the gate 42, the mechanism 36 would be set in motion to lower the stack onto the belts 28 for transverse delivery to the handling position. The stack lowering device is then lifted and the whole cycle repeats.

In an alternate method of obtaining complete automatic operation, the sheet stop 42, cooperating with the fingers 32 to form a sheet receiving cradle, may be provided with a stack height control 44 of known construction for operating the gate 26 and fingers 32 in proper timed relation.

Specifically the stack height control 44 includes a switch 46 supported for adjustment toward and away from the level of the belt conveyor 28, an energizing circuit being completed by the fixed switch contact 48 and the movable switch contact 50. The latter contact is engaged by the sheets forming the stack S and comes into conductive contact with the fixed contact 48 to complete the circuit which controls the operating mechanisms 36 for the stack lowering fingers 32.

The lowering of the gate 26 is likewise coordinated into the conveying and stack lowering arrangement by the operating mechanisms 52 therefor which include a piston 54 supported for reciprocation within the cylinder 56. The sequence of operation for the gate 26 and the lowering of the fingers 32 is selected so that upon the proper stack height being reached, as determined by the closing of the switch contacts 48, 50, the gauge 26, under control of mechanisms 52, is swung into the position wherein it blocks further feed of sheets to the drop-off location and thereafter the fingers 32 lower the formed stack S onto the belt conveyor 28 for removal to a take-off station.

By the arrangement of the conveying unit 19 and the lateral take-off unit 27 with a coordinated gate 26 and stack lowering fingers 32, it is possible to remove the output of the lower knife 16, removal of the cut sheets being effected in stacks of predetermined heights and at selected intervals.

When the take-off table is to be employed in removing the output of both the upper and lower knives 12, 16 at the same time, it is necessary to provide a bridge conveyor 60 arranged to extend over the units 19, 27. This conveyor includes a first section 62 inclined upwardly from an end positioned at the level of the belt delivery 14 and a second section 64 in end to end alignment with the section 62 and extending toward a further drop-off

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location. At this drop-off location, there is arranged a gate 26' operated through mechanisms 52' similar in construction to the cooperating piston and cylinder 54, 56 associated with the gate 26.

Under certain circumstances, it may be advantageous to have a further operator positioned adjacent the mechanism 26' and operating this gate with a foot control for removing the output of the upper knives 12, this output being transported along the bridging conveyor 60 from the delivery end thereof toward the gate 26' and eventually deposited on a fixed table for removal by the operator.

However, space requirements and further consideration suggest the desirability of an additional lateral take-off unit 27' arranged generally at a level below the drop-off location of the bridge conveyor 60 and in side by side relation to the similar lateral take-off unit 27. The unit 27' is constructed and arranged in accordance with the principles previously outlined and a detailed description of this unit will be omitted in the interest of simplicity and clarity. For the present purposes it will suffice to point out that the unit 27' includes stack lowering fingers 32' operated by suitable mechanisms 36' and coordinated to the gate 26' by means of a stack height control 44' or a suitable timing control device which will perform the same function.

By the arrangement of the conveying unit 19, the bridging conveyor unit 60, and the lateral take-off tables 27, 27', it is possible to remove the output of a duplex cutting machine 10 with the requisite speed, removal of the sheets being accomplished in stacks of predetermined height or at predetermined intervals of count. Additionally, savings in floor space are realized since one or more operators can work in an area closely adjacent to the general delivery path of the duplex machine yet laterally off-set from this delivery path. As is apparent to those skilled in the art, it is possible to carry forth this teaching to cutting machines having three, four or more output arrangements arranged at different levels relative to each other.

In the foregoing I have described my invention solely in connection with specific illustrative embodiments thereof. Since many variations and modifications of the invention will now be obvious to those skilled in the art, I prefer to be bound not by the specific disclosures herein contained but only by the appended claim.

I claim:

A take-off table for receiving a stack of sheets from the delivery ends of sheet cut-off mechanisms at different levels comprising continuously operating first conveyor means arranged to move sheets from one of said cut-off mechanisms in a first direction to a sheet drop-off location, continuously operating second conveyor means arranged to move sheets in a second direction substantially normal to said first direction, said second conveyor means including a stack receiving part at a level adjacent to and below said drop-off location, a sheet stop extending generally in said second direction adjacent said stack receiving part and adjustable in said first direction toward and away from said sheet drop-off location, stack lowering means including fingers cooperating to define a platform adjacent said stop and over said stack receiving part, actuating means operatively connected to said fingers for moving same to the level of said stack receiving part to deposit a stack of sheets onto the latter, a gate movable into a sheet blocking position relative to said first conveyor means in dependence upon movement of the stack lowering means to preclude delivery of sheets to said stack lowering means during deposit of a stack on said second conveyor means, a third conveyor means bridging said first and second conveyor means and arranged to move sheets from the other of said cut-off mechanisms in said first direction to another sheet drop-off location, fourth conveyor means arranged to move sheets in said second direction, and an-

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other gate movable into a sheet blocking position relative to said third conveyor means to preclude drop-off of sheets from the latter, said fourth conveyor means including a stack receiving part at a level adjacent to and below said last named drop-off location, another sheet stop extending generally in said second direction adjacent the last named stack receiving part and adjustable in said first direction toward and away from said last named sheet drop-off location, another stack lowering means including fingers cooperating to define a platform adjacent said last named stop and over said last named stack receiving part, and actuating means operatively connected to said last named fingers for moving same to

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the level of said fourth conveyor means to deposit a stack of sheets thereon.

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