April 10, 1962 K. G. L. LINDQVIST 3,028,980

APPARATUS FOR BUILDING AND WEIGHING STACKS OF SHEETS

Filed Dec. 15, 1958 2 Sheets-Sheet 1

Fig.1

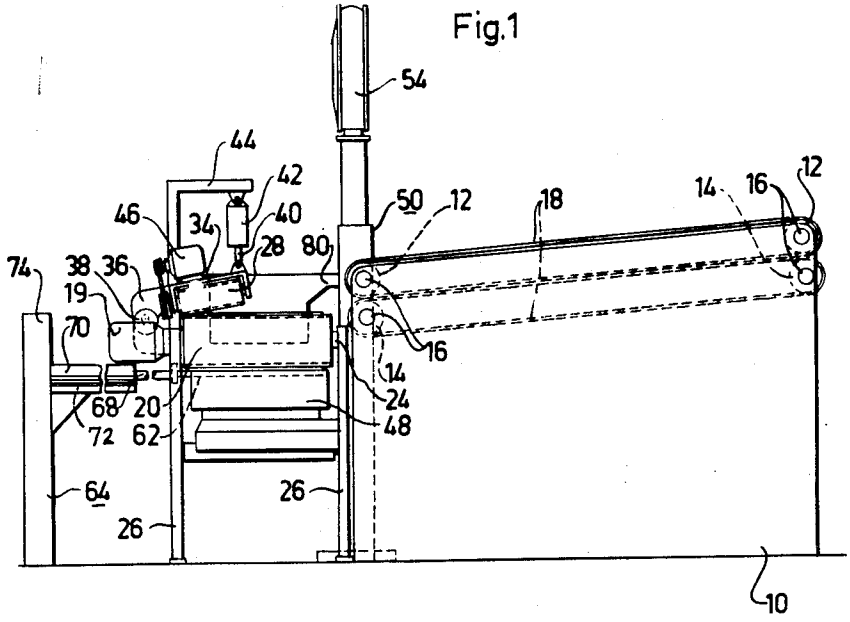
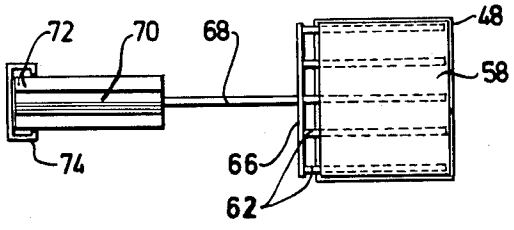


Fig. 3



INVENTOR.

Karl Gösta Lennart Lindquist

BY

W. P. Carr

ATTORNEY

April 10, 1962 K. G. L. LINDQVIST 3,028,980

APPARATUS FOR BUILDING AND WEIGHING STACKS OF SHEETS

Filed Dec. 15, 1958 2 Sheets-Sheet 2

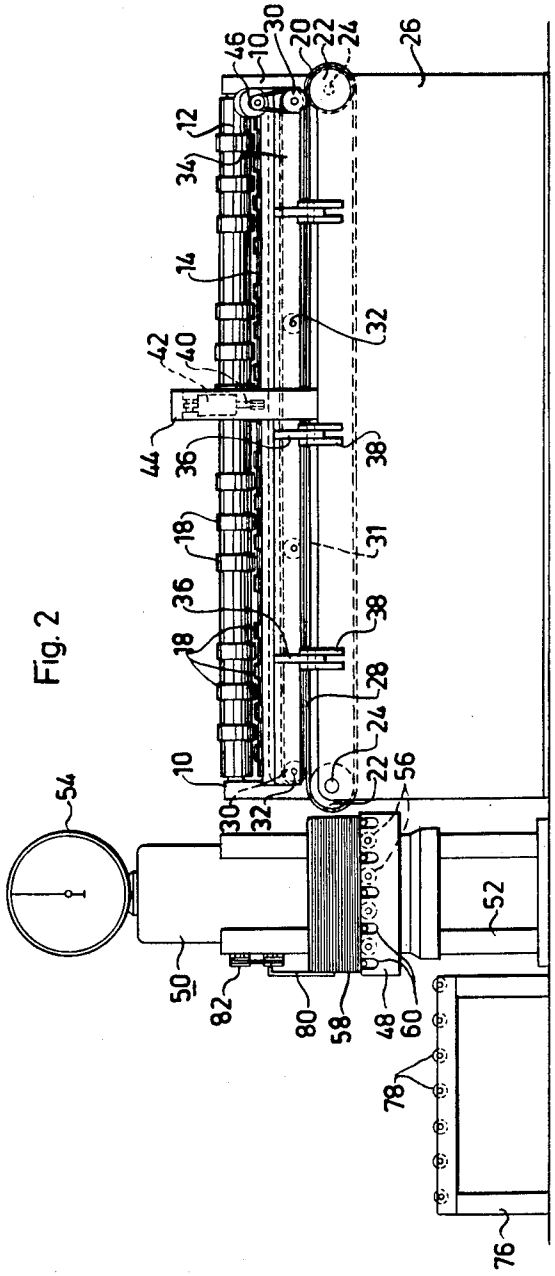


Fig. 2

INVENTOR.

Karl Gösta Lennart Lindquist

BY

W P Carr

ATTORNEY

United States Patent Office 3,028,980 Patented Apr. 10, 1962

3,028,980

APPARATUS FOR BUILDING AND WEIGHING STACKS OF SHEETS

Karl Gösta Lennart Lindqvist, Nasbypark, Sweden, assignor to Svenska AB Toledo, Stockholm, Sweden, a corporation of Sweden

Filed Dec. 15, 1958, Ser. No. 780,558
3 Claims. (Cl. 214—6)

This invention relates to apparatus for building stacks, having uniform weight and dimensions, of sheets of variable weight delivered in adjacent rows. More specifically the invention relates to layboys or apparatus adapted to receive sheets of wood pulp, cut from a continuous web as produced in a pulp mill, and to arrange the sheets in stacks of predetermined weight and uniform height for baling.

The amount of water in a web of pulp issuing from a pulp machine is generally greater in the marginal portions of the web. This causes the sheets from the outside rows of the sliced web to be heavier due to their greater water content than the sheets from the inner rows, while not being any thicker. Bales formed from the outside sheets do not require as many sheets to reach the desired weight and will be shorter than the bales built from the inner rows of sheets.

This has several undesirable effects. One is that the lack of uniformity in size makes packing for shipping or storage more difficult. Another serious consequence is that the water content of a bale built from the sheets of an outside row is greater than that built from an inside row, while the proportion of pulp is lower. As pulp content is the basic price factor this variation makes evaluation most difficult. Also it complicates accurate processing of such pulp in some subsequent chemical operations where the water component must be uniform.

For these reasons methods have been developed for building stacks to the required weight with approximately an equal number of sheets from each row of sheets as created by slicing and cutting the web of pulp discharged by the pulp forming equipment. These methods have not been as accurate in results as desired because they utilized quite a number of consecutive sheets from each row and uniformity of the bales was thus more likely to be affected by any change in moisture content longitudinally of the web. Also such methods have met with difficulties in handling the sheets at the higher production rates required by recent market demands.

The principal object of this invention is to provide layboy apparatus for rapidly forming stacks of sheets of pulp as close as possible to the exact weight desired in the final bale.

A further object of the invention is the provision of means for automatically proportioning, stacking and weighing sheets of pulp as continuously delivered from a high production pulp machine.

The apparatus of the invention by which these objects are attained utilizes a belt conveyor arrangement moving crosswise of the outlet end of the pulp machine to receive the several rows of sheets delivered by the machine and to continuously carry the sheets to a stacking and weighing station at one end of the apparatus disclosed herein is adapted to a pulp machine from which four rows of sheets are discharged.

The speed of the belt conveyor is sufficiently faster than the feeding movement of the pulp web to carry one sheet of each row deposited on the conveyor to the stacking and weighing station before the next cross set of one sheet from each row drops upon the conveyor. The apparatus includes means for holding the sheets during this fast travel toward the stacking station.

The layboy apparatus provided by this invention will

be described hereafter with reference to the embodiment shown in the accompanying drawings, in which:

FIGURE 1 is a side elevation of an apparatus embodying one form of the invention;

FIGURE 2 is a frontal view of the apparatus of FIGURE 1 with portions removed; and

FIGURE 3 is a plan view of a device constituting a part of the apparatus which temporarily receives sheets at the weighing station of the apparatus, while a stack of the desired weight is transferred from the station.

The conventional pulp trimming machine, which cuts the continuous pulp strip into sections or sheets, is not shown in the accompanying drawings, as it is not thought essential to a clear understanding of the operation of the present layboy apparatus which, it is to be understood, is applicable to various types of pulp trimmers, slitters and cutters without any material change.

It will also be stated that while the present apparatus is applicable to the stacking of sheets of pulp, cardboard, paper and the like, in the following description it will be described in connection with the stacking of sheets of pulp, but with the understanding that the description relates equally to the other uses.

The pulp, as it comes to the trimming machine, is in the form of a continuous web, usually eight, ten or more feet in width. In the trimming machine the web is trimmed along the edges, slit lengthwise into a plurality of strips of predetermined width, and is then cut transversely to produce the rectangular pieces or sheets of standard size.

The present continuous layboy provides means for receiving these cut pieces or sheets from the trimming machine, and for delivering them successively upon a crosswise traveling stacking conveyor.

For purposes of discussion the web of pulp will be considered as having an original width of twelve feet and to be sliced into three foot strips which are cut into two foot sections. The web is thus divided into sheets three feet across by two feet wide lengthwise of the web.

Referring to the drawings in more detail, the layboy apparatus there illustrated includes a feeding device mounted upon side plates 10. A pair of upper rollers 12 and a pair of lower rollers 14 are rotatably supported across the ends of plates 10 with their end shafts 16 journalled in bores in the plates.

Twelve narrow, fabric belts 18 run between the upper rollers 12. These endless belts are disposed in four groups of three belts each. There are also sixteen of the belts 18 running between the lower rollers 14.

The belts on the lower rollers are arranged in four groups of four belts each. The four belts of each of these last mentioned groups are spaced and located to receive between them the three belts of a group running between the upper rollers 12. Each set of belts, including three upper and four lower belts, is designed to receive and propel one of the four rows of sheets arriving from the pulp machine.

Through sprockets and a chain drive the belts 18 are driven continuously at a precise speed by an electric motor and an associated speed reducer. For purposes of this invention the rate of movement of belts 18 may be definitely higher than that of the slicing machine from which the sheets of pulp are received by the belts. This establishes spacing longitudinally of the belts between each lateral set of four sheets, although overall delivery rate of the sheets is not increased.

If for instance, the slicing machine carries the pulp at twenty feet per minute, the belts may be driven at sixty feet per minute which would leave four feet free longitudinally of the belts between each lateral set of sheets, the sheets being two feet wide lengthwise of the belts and three feet long in their transverse dimension. This inter-

vening space of four feet at the cited rate of travel of the belts provides a period of four seconds between the release by the belts of one lateral set of sheets and the beginning of the discharge from the belts of the next lateral set.

Positioned crosswise of the outlet ends of belts 18 is belt conveyor 20 upon which the sheets, issuing from belts 18 in four longitudinal rows, are deposited. Conveyor 20 travels around drums 22, the end shafts 24 of which are lodged in bores in opposite sides of the casing 26.

By connection with an end shaft 24 of one of the drums 22 a motor unit 19 drives the belt at a speed which may be in this case one hundred and eighty five feet per minute.

Above conveyor 20, on the side away from delivery belts 18, is a sheet retaining belt 28. It is turned around a pair of rollers 30 for movement along substantially the full length of conveyor 20. End rollers 30 and intermediate idler rollers 31, for supporting the belt 28, are mounted through their shafts 32 between the sides of U-beam 34. This beam 34 is supported upon three arms 36 which are pivotally connected to brackets 38 on the casing 26.

Belt 28 is brought downward against conveyor 20 and pulled upward therefrom by swinging movement of the beam 34 on brackets 38. This movement is motivated by the fluid driven plunger 40 from cylinder 42, the plunger being connected to the beam 34. Cylinder 42 is suspended from the angled post 44 extending upwardly from the casing 26. Belt 28 is driven by motor 46 at a rate synchronized with that of conveyor 20. Motor 46 is carried on beam 34 and has a belt driving connection with roller 30. The interval between the delivery to conveyor 20 of successive lateral sets of sheets from belts 18 leaves open space for the upward swing of belt 28 on beam 34.

At the discharge end of conveyor 20, shown at the left in FIGURE 2, is a weighing and stacking table 48 sitting upon the platform of a weighing scale 50 which in turn is supported upon legs 52. The dial 54 of the scale has a conventional swinging indicator needle.

Within table 48 are mounted normally stationary wheels 56 the rims of which extend above the top of table 48 to provide supporting elements for a stack 58 formed of sheets arriving from conveyor 20. Slots 60 extend downwardly in table 48 between the rows of wheels 56.

Projecting horizontally into the slots 60 are a series of parallel fingers 62. These are carried on a bar 66, as shown in FIGURE 3, which is fixed to the end of a piston rod 68. The latter is retractable with fluid actuated movement of the piston within cylinder 70. A guide block 72 supports cylinder 70 and in turn is vertically slidable within the upright channel 74. This vertical movement of block 72 is controlled with electrically operated mechanism or by a fluid driven piston.

In line with the stacking table 48 and the conveyor 20 is an additional conveyor 76 with rotating elements 78 for transporting a stack 58 of the desired weight to a baling station after it has been removed from the stacking table 48.

In the operation of this apparatus under the conditions prescribed for discussion purposes, it is associated with a pulp machine producing a web having a twelve foot width and progressing through the trimming and cutting mechanism at the rate of twenty feet per minute. It is considered that this mechanism slices the web into four strips of three foot width which are divided by lateral cuts into two foot sections. Accordingly four rows of sheets with a broad dimension of three feet and a longitudinal stretch of two feet are delivered to the feeding belts 18.

As the travel of belts 18 is arranged to be sixty feet per minute or three times as rapid as the web advancing movement through the trimming and cutting mechanism, each transverse set of sheets reaching belts 18 are pulled away from the subsequent set not yet released by the trimming mechanism. Due to the difference in speed of the belts and the mechanism a longitudinal spacing of four feet between lateral sets of sheets carried by the belts is thus established. As previously stated this spacing results in a four second interval following the deposit of each lateral set of sheets before the next lateral set starts to leave the belts.

Within this period of four seconds conveyor 20 carries the four sheets received thereon to the stacking station 48 and thereby is ready to receive the following set. As the four sheets are three feet long lengthwise of conveyor 20 and are separated slightly in the slitting operation, conveyor 20, in the present instance, must move somewhat faster than twelve feet in the four second interval or about one hundred and eighty five feet per minute.

At this high speed it is desirable to hold the sheets in place upon conveyor 20. This is accomplished by pressing the retaining belt 28 which is traveling at the same rate as conveyor 20 against the deposited sheets. The belt 28 is swung downwardly by precisely timed descent of plunger 40 through admittance of fluid to cylinder 42. The belt is thus held down for a period approaching four seconds and is withdrawn upwardly for a period of two seconds for the receipt of the next set of sheets upon conveyor 20. This timing may be synchronized mechanically by a cam operated fluid valve or through electronic timing elements.

The sheets received by conveyor 20 are thus delivered in single file, with one sheet at a time from each longitudinal row formed from the original pulp web, to the stacking and weighing table 48. The sheets projected by conveyor 20 upon the weighing table are vertically aligned thereon by abutment against the plate 80. The latter is raisably suspended from the pivotal mounting 82.

The sheets continuously accumulate on the stacking and weighing table 48 in series of one from each of the four longitudinal rows as cut by the trimming and slicing mechanism. There is accordingly no concentration of either the marginal sheets carrying more water or of the drier center sheets.

When the stack on table 48 reaches the desired final weight a reporting device deacts to the arrival of the indicator needle at the predetermined point on the dial 54. This may be a photoelectric cell or a magnetically sensitive element. In immediate response thereto fingers 62 are forced outwardly above the stack, from a neutral position at the required height, to temporarily receive sheets arriving from conveyor 20. The pivotal mounting 82 is also motivated to raise stop plate 80. The wheels 56 simultaneously react to the signal and are motivated to move the stack over to conveyor 76 for delivery to the subsequent baling station.

Following placement of the stack on conveyor 76 the fingers 62 are moved downwardly into the grooves 60 by the fluid driven piston connection with the sliding guide member 72. Stop plate 80 is likewise moved downwardly from its upward position wherein it has acted as a stop for the sheets received by the fingers 62.

As soon as the sheets accumulated upon the fingers 62 are received on table 48 by the entry of the fingers in grooves 60 the cylinder 70 functions to withdraw piston rod 68 and the fingers from the grooves, and the slide member 72 is raised to bring the fingers back to their upward neutral position ready for projection into the path of sheets from conveyor 20 as soon as the next stack on table 48 reaches the set weight.

It may be concluded from the preceding that the objects of the invention have been fully attained through the disclosed apparatus. Stacks are created from sheets taken singly from successive rows of the original web of wood pulp in a manner whereby differences in the sheets are best compensated for, and a method is provided for han-

dling the stacking of sheets delivered at a high production rate.

Various modifications in the disclosed embodiment of the invention may be made without departing from the spirit of the invention. For instance a suction chamber below conveyor belt 20 may be utilized for retaining sheets thereon during their transit to the stacking station 48 in place of the retention belt 28.

It should be understood that specific dimensions and rates of travel have been set forth for purposes of explanation only and that such data should not be taken as that necessarily preferred for practicing the invention.

Other alterations and substitutions may be made within the precepts of the invention and scope of the accompanying claims.

I claim:

1. Apparatus for building stacks, possessing uniform weight and dimensions, of sheets issuing in closely arrayed lateral and longitudinal rows from a wood pulp machine, said apparatus including a supplemental conveyor first receiving the sheets issuing from the wood pulp machine, driving means operating the supplemental conveyor at a substantially higher speed than the pulp machine whereby the lateral rows of sheets on the supplemental conveyor are spaced apart longitudinally thereof, a continuously moving conveyor positioned crosswise of the discharge end of the supplemental conveyor for receiving successive lateral rows of sheets, a stacking station at one end of the continuously moving conveyor upon which the sheets of each successive row of sheets are deposited, the continuously moving conveyor travelling at a sufficient speed to deliver one row of sheets to the stacking station before the next row of sheets leaves the discharge end of the supplemental conveyor, means holding the sheets on the continuously moving conveyor while they are travelling thereon, said means being operative when sheets are on said conveyor, but arranged to be out of the path of the sheets as they are received on said conveyor from the supplemental conveyor.

2. Apparatus according to claim 1 in which the means holding the sheets comprises a travelling belt, a pivotable support therefor, and mechanism for periodically pivoting said support to bring the travelling belt down upon sheets on the continuously moving conveyor.

3. Apparatus according to claim 2 in which the travelling belt is narrower than the continuously moving conveyor and is brought down upon a side portion only of sheets on the continuously moving conveyor.

References Cited in the file of this patent

UNITED STATES PATENTS

2,061,782	Stroud	Nov. 24, 1936
2,612,981	Alden	Oct. 7, 1952
2,795,312	Howdle	June 11, 1957
2,839,205	Toby et al.	June 17, 1958
2,849,236	Beaulieu	Aug. 26, 1958
2,877,883	Lanham	Mar. 17, 1959
2,930,493	Sunblad et al.	Mar. 29, 1960