Nov. 7, 1944. H. T. HONIG 2,362,134

GATHERING MACHINE

Filed Aug. 25, 1941 2 Sheets-Sheet 1

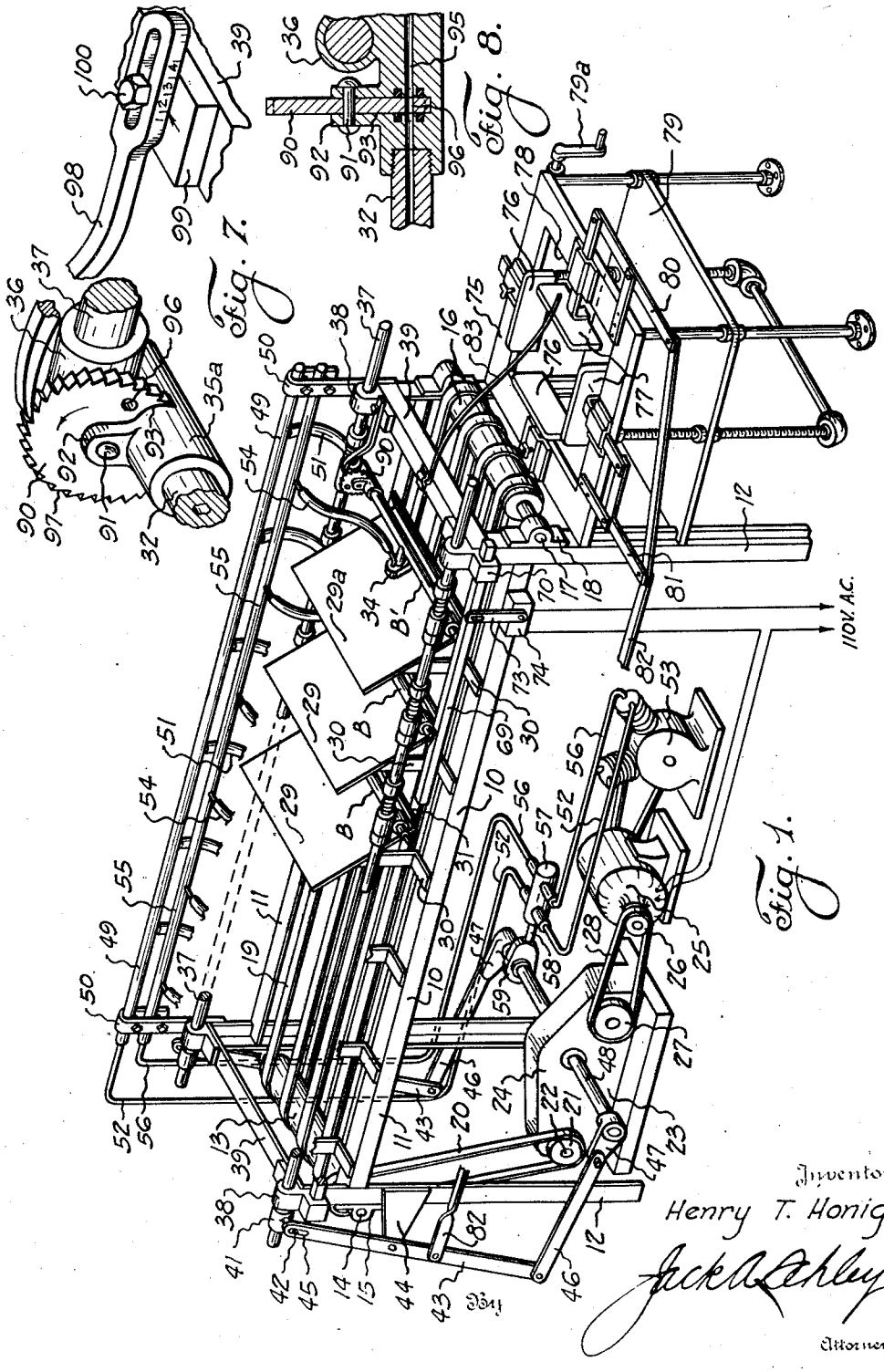


Fig. 1.

Fig. 7.

Fig. 8.

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GATHERING MACHINE

Filed Aug. 25, 1941 2 Sheets-Sheet 2

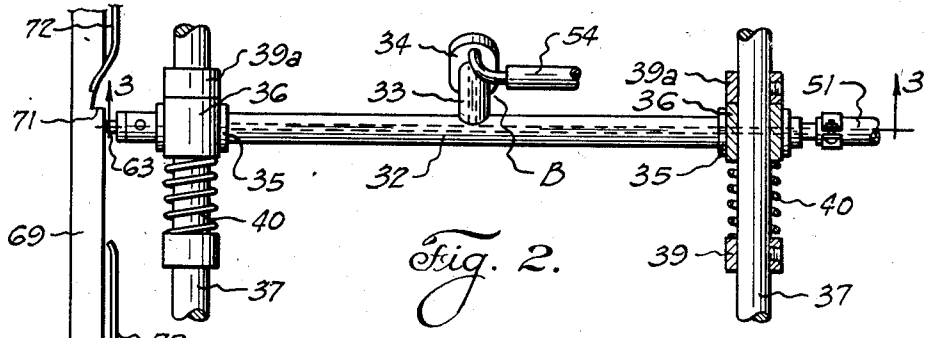


Fig. 2.

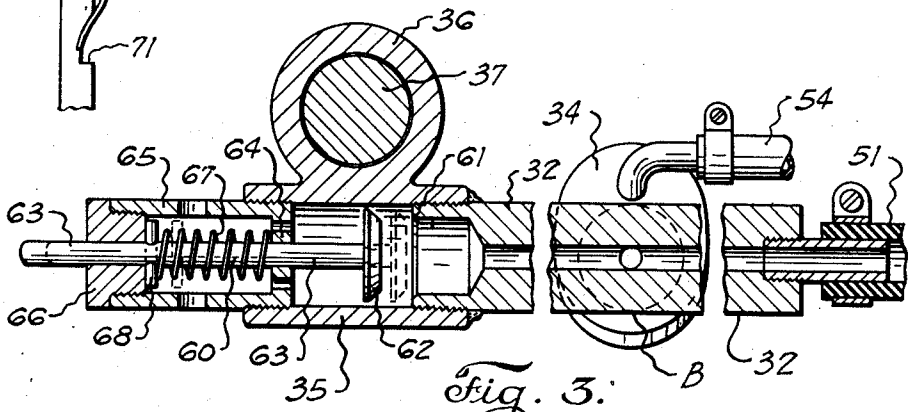


Fig. 3.

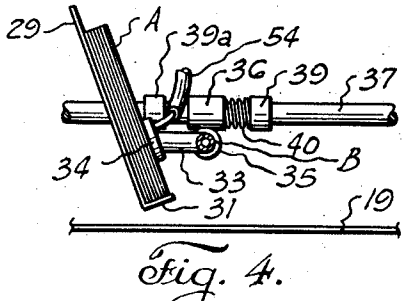


Fig. 4.

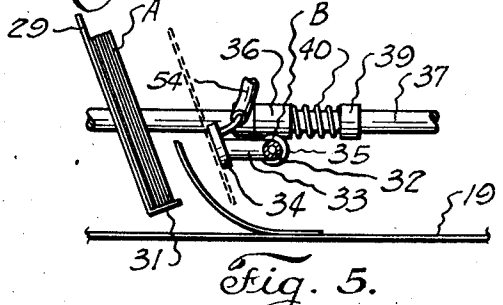


Fig. 5.

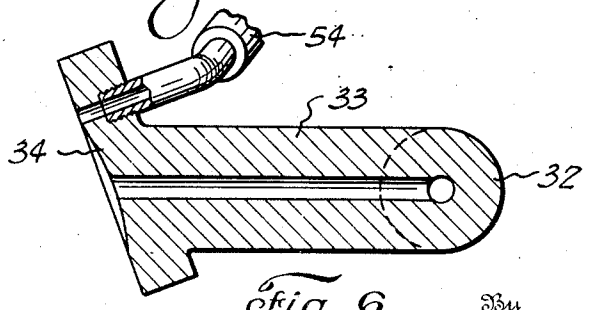


Fig. 6.

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Patented Nov. 7, 1944

2,362,134

UNITED STATES PATENT OFFICE

2,362,134

GATHERING MACHINE

Henry T. Honig, Dallas, Tex.

Application August 25, 1941, Serial No. 408,144

6 Claims. (Cl. 270—58)

This invention relates to new and useful improvements in gathering machines.

One object of the invention is to provide an improved machine for gathering sheets of paper or the like, and having means for conveying the same from the sheet receptacles or supports in proper order and for stacking or arranging said sheets in a desired manner, the entire operation being automatic.

An important object of the invention is to provide an improved gathering machine for automatically and continuously arranging a plurality of sheets in a desired manner, whereby books or pads having duplicate, triplicate or other numbers of identical sheets arranged in proper order, may be formed.

A particular object of the invention is to provide a gathering machine wherein the individual sheets are supported upon or within an individual receptacle, together with means for removing the sheets one at a time and in a desired order and transferring the same to a conveyor, said conveyor depositing the sheets within a stacking receptacle in the order in which said sheets are deposited upon the conveyor, whereby said sheets are assembled in a predetermined manner in accordance with their order of removal from their respective receptacles.

Another object of the invention is to provide an improved gathering machine, of the character described, wherein a separate receptacle or container is provided for receiving the base pads which are to form the backs of the tablets or books being assembled, said receptacle being provided in addition to the other receptacles and having means associated therewith for removing the pads at the proper time and depositing them on the conveyor so that proper assembly may be carried out; the removing means being readily adjustable, whereby any predetermined number of sheets may be assembled on each pad which is deposited on the conveyor, thereby permitting books or tablets containing any desired number of sheets to be gathered.

Still another object of the invention is to provide a gathering machine, of the character described, having a manual adjustment for controlling the discharge of the base pads or backs, which discharge is automatically controlled, whereby after the adjustment is made, the assembly of the sheets and pads may be uninterruptedly and continuously carried out.

Still another object of the invention is to provide an improved gathering machine wherein the means for removing the sheets and pads from their respective receptacles, the conveyor and the means for stacking said sheets are all actuated by a single prime mover, whereby said operating parts are readily synchronized to gather the sheets and pads in a desired manner and also whereby construction of the apparatus is simplified.

A further object of the invention is to provide a gathering apparatus, of the character described, having an improved suction means for effecting removal of each sheet from its supporting rack or receptacle and for depositing the same upon the conveyor; said suction means being constructed so that in the event a sheet is missed, the apparatus is automatically halted, whereby accuracy of said apparatus is assured and erroneous gathering is obviated.

Another object of the invention is to provide an apparatus, of the character described, having an inclined support for each set or group of sheets, said support facilitating removal of each sheet because it is only necessary that the lifting or removing unit move said sheet a minimum distance outwardly from the remaining sheets, after which said sheet may be released and permitted to fall by gravity onto the conveyor; the arrangement not only simplifying the construction of the various lifting units but also making possible a smaller and more compact device since the travel of the lifting units is minimized.

The construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, as an example of the invention is shown, and wherein:

Figure 1 is a partial, isometric view of a gathering machine, constructed in accordance with the invention,

Figure 2 is a plan view of one of the pick-up units,

Figure 3 is an enlarged, partial, transverse sectional view, taken through the pick-up unit on the line 3—3 of Figure 2,

Figure 4 is an enlarged elevation of one of the supports or racks and illustrating the pick-up nozzle engaging the uppermost sheet,

Figure 5 is a similar view, showing the nozzle releasing the sheet after said sheet has been lifted from the support,

Figure 6 is an enlarged sectional detail of the pick-up nozzle,

Figure 7 is an isometric view of the control valve for the suction removing means which is associated with the base pad receptacle, and

Figure 8 is a partial, longitudinal section, taken through said valve.

In the drawings, the numeral 10 designates a frame or supporting structure which is substantially rectangular in shape and which includes longitudinal, angular bars 11 which are supported by suitable legs 12. A roller 13 extends transversely across the frame 10 at one end

thereof and has its shaft 14 mounted in suitable bearings 15 secured to the legs 12. A similar roller 16 is mounted at the opposite or discharge end of the frame 10 and has the ends of its shaft 17 journaled in bearings 18. A plurality of conveyor belts 19 pass over the rollers 13 and 16 and form a travelling conveyor which moves longitudinally of the frame 10.

For driving the conveyor formed by the belts 19, the roller 13 has a drive belt 20 passing thereover and said belt also passes around a pulley 21 which is mounted on the shaft 22 of a drive gear mechanism 23. The drive gear mechanism is housed within a suitable casing 24 and the particular gear mechanism thereof is not shown as any suitable device of this character may be employed. The gear mechanism is operated by an electric motor 25 which has a driving connection with the gear mechanism 23 by means of pulleys 26 and 27 and an endless drive belt 28. Manifestly, the gear mechanism 23 may be arranged to drive the conveyor belts 19 at any desired speed, whereby said belts travel longitudinally within the frame 10 at a predetermined rate.

A plurality of sheet supporting racks 29 are mounted above the conveyor belts 19 and are supported on angular brackets 30 which extend upwardly from the angular bars 11 of the frame. Each rack is inclined from the vertical and has its lower end formed with a flange or base 31 which is disposed at substantially a right angle to the remainder of said rack. The end rack 29*a* which is identical in construction to the other racks is provided for the purpose of receiving the backboards or base pads (not shown) which form the back of the tablet or book being assembled. A plurality of sheets A (Figures 4 and 5) are placed on the racks 29 and the lower edges of the sheets rest upon the base 31. Due to the inclination of each rack 29 and the rack 29*a*, it is obvious that the sheets and backboards will remain in position on their respective racks. Only two racks 29 have been illustrated in addition to the rack 29*a*, but obviously any desired number may be disposed throughout the length of the frame. Each rack 29 supports a stack of sheets which are identical and the sheets of one rack are different, usually in color, from the sheets supported on another rack.

For removing the sheets A and backboards from the various racks 29 and from the rack 29*a*, and depositing said sheets upon the conveyor belts 19, a plurality of pick-up units B are provided, one unit being provided for each rack 29, a similar pick-up unit B' provided for the rack 29*a*. Since all of the pick-up units are identical in construction, a description of one will suffice. Each pick-up unit includes a horizontal hollow rod or shaft 32 which extends transversely across the frame. A tubular stem 33 extends outwardly from the central portion of the rod 32 and has its interior communicating with the bore of said rod. An enlarged head 34 forming a pick-up nozzle is secured to the outer end of the stem 33 and manifestly, when a suction is applied in the bore of the rod 32, said suction acts through the stem and through the head or nozzle 34 to pick up any object adjacent the outer face of said head or nozzle. The nozzle is adapted to engage the uppermost sheet A in its respective rack 29, or the uppermost backboard in the rack 29*a*, after which a suction is applied, as will be explained, so that said uppermost sheet or backboard is removed from its stack. After removal, the rod 32 and head 34 are moved away from the rack and the suction is released and air pressure applied to cause the sheet to drop downwardly onto the conveyor belts 19.

The ends of the rod 32 are secured within collars 35 and each collar 35 is preferably made integral with a bearing collar 36, the latter being disposed at a right angle to the collar 35. For slidably mounting the rod 32 and the nozzle 34 carried thereby so that these parts may undergo a longitudinal movement within the frame, each bearing collar 36 surrounds a supporting shaft 37 which is disposed above one of the angular bars 11 of the frame 10. The supporting shafts 37 are located, one on each side of the frame, as is clearly shown in Figure 1, and extend throughout the length of said frame. The ends of each shaft 37 are slidably mounted within bearings 38 which are secured to a transverse supporting bar 39 which spans the space between the upper ends of the legs 12 of the frame.

As explained, the bearing collars 36 are slidable on the shafts 37 and said shafts are in turn slidable within their respective bearings 38. For imparting a longitudinal movement to each rod 32 through the collars 36, which are secured to said rod, when the shafts 37 are moved, each shaft has a pair of stop rings 39 and 39*a* secured thereto, these rings being located one on each side of each bearing collar 36 and being spaced from each other, as is clearly shown in Figure 2. A coiled spring 40 is confined between one end of the collar 36 and the ring 39, and this spring constantly urges the collar 36 into engagement with the other stop ring 39*a*. With this arrangement, when the nozzle 34 is in a position spaced from the sheets A on its rack, the parts are in the position shown in Figures 2 and 5, the springs 40 holding the bearing collars 36 in engagement with the stop rings 39*a*. When the shafts 37 are moved longitudinally in a direction to move the nozzle toward the rack, movement is imparted to the bearing collars 36 and also to the rod 32 and nozzle 34, such motion being transmitted through the springs 40 and the stop rings 39. When the nozzle 34 engages the uppermost sheet, or in the case of the rack 29*a* the uppermost backboard, any continued movement of the shafts 37 will be permitted and will result only in a compression of the springs 40. The provision of the springs makes it possible for the nozzle to engage each sheet on the stack, regardless of the thickness of said stack.

For reciprocating the shafts 37 to move the pick-up nozzles 34 into engagement with the sheets on the various racks 29, the outer end of each shaft has a collar 41 secured thereto and this collar is provided with a radially extending pin 42. An operating lever 43 is pivoted intermediate its ends on a bracket 44 and the upper end of this lever has a slot 45 which engages over the pin 42. The lower end of each lever 43 is connected by a link 46 with a crank arm 47, said arm being mounted on the projecting end of a drive shaft 48 which forms a part of the drive gear mechanism 23.

Manifestly, when the shaft 48 is rotated to rotate the crank arms 47, the levers 43 will be swung on their pivot, whereby a simultaneous reciprocation of the operating shaft 37 is accomplished. Through the stop rings 39 and the bearing collars 36, the sliding movement of the shafts 37, will result in a reciprocation of the various pick-up units, whereby the nozzles 34 of the pick-up units are moved into engagement with the sheets A on their respective racks and are then

moved outwardly away from said rack. It is noted that the reciprocation of the operating shafts 37 is accomplished by the same drive means which operates the conveyor belts 19.

For effecting a pick-up of the uppermost sheet of each stack on the various racks 29, a suction manifold 49 in the form of a longitudinal pipe is mounted on suitable brackets 50 which extend upwardly from the frame 10. This manifold has connection with the bore of each rod 32 of each pick-up unit B by means of a flexible hose 51 which is secured to the extended end of the rod (Figure 2). The suction manifold 49 is also connected through a suction line 52 with the suction side of a suitable pump 53. When the pump 53 is operating and the nozzles 34 are engaged with the uppermost sheets of the stacks on the racks 29, it will be obvious that the uppermost sheet of said stack will be picked up by said nozzles. The operation is synchronized, as will be explained, so that as the nozzles engage the uppermost sheets of the various stacks, the suction is applied and the suction is not released until the shafts 37 have reciprocated to move the nozzles away from the stacks of sheets, which position is shown in Figure 5. At this point in the operation, the suction is released to release the sheets from the nozzles.

To assure the release of the sheets from the various nozzles, each nozzle has connection through a hose 54 with an air manifold 55. The air manifold is supported in the brackets 50 below the suction manifold and has connection through a line 56 with the power side of the pump 53. A suitable valve 57, the details of which are not shown, is interposed or connected in the suction and air lines 52 and 56 and is operated by a movable plunger 58. This plunger is adapted to be depressed by means of a cam 59 which is secured on the shaft 48 of the gear mechanism 23. The valve mechanism and cam is so constructed that when the nozzles engage the uppermost sheets of the various stacks, the valve is actuated to apply a suction to the nozzles through the line 52, suction manifold 49, and rods 32. The valve remains in this position until the nozzles have moved away from their respective stacks to the position shown in Figure 5, at which time the valve 57 is actuated to release the suction and apply air to the air manifold 55. This causes a charge of air to be transmitted through each hose 54 to the nozzles 34 and this blast of air forces the sheet which has been picked up by the nozzle to be disengaged from said nozzle. In this manner, release of the sheet is assured when the suction is released. Since the cam 59 which controls operation of the valve 57 is mounted on the shaft 48, which shaft actuates the reciprocating or operating shaft 37, it is obvious that the operation of the valve may be readily synchronized with the operation of the shaft 37 and of the pick-up unit B.

As explained, the pick-up unit B' which is associated with the rack 29a on which the backboards are mounted, is substantially identical in construction to the other units. However, it is apparent that since each board forms the back of the tablet or pad being assembled, one board need not be removed each time one sheet is removed from the other stacks. Obviously, if the pad being assembled is to contain fifty sheets in duplicate, then one board is removed from the rack 29a each twenty-fifth reciprocation or operation of the pick-up units; similarly, if the pad is to contain fifty sheets, one board is removed from the rack 29a for each fifty sheets removed from the other racks 29, and so on, whereby the order of removal of the backboards is in accordance with the size of the tablets or pads being assembled.

The unit B' for the rack 29a is movable each time with the other units since it is mounted in the same way, being actuated by the shafts 37, through the rings 39 and collars 36. However, in order for the unit B' to pick up a board, it is necessary that suction be applied to the nozzle upon engagement with the uppermost board. Instead of controlling this suction solely by the valve 58, as is the case of the other units B, suction to the unit B' is controlled in addition by an auxiliary, rotatable valve element or disk 90 (Figures 7 and 8). This element is journaled on a pin 91 which is supported in ears 92 which extend upwardly from the collar 35a. The lower peripheral portion of the disk is movable within an arcuate slot 93 in said collar, whereby this portion of said disk traverses the bore 95 of the collar. The disk is formed with an opening 96 which is disposed nearer its outer periphery and this opening is adapted to register with the bore 95 of the collar and manifestly, when in registration therewith, suction may be applied to the nozzle of the unit B'.

For actuating the valve disk, ratchet teeth 97 are formed on the periphery of the disk and these teeth are arranged to engage a pawl 98, which is mounted on a block 99 secured to the frame of the machine. The pawl is adjustably mounted on the block by means of a set screw 100, whereby its end may be adjusted relative to the disk. The disk, being carried by the collar 35a, is movable with the unit B' each time the shafts 37 are reciprocated. As the disk reciprocates upon each operation, the ratchet teeth thereof engage the pawl 98 and a predetermined rotation is imparted to the disk upon each movement of the shafts. The degree of rotation is, of course, controlled by the adjustment of the pawl relative to the disk. With this arrangement, a predetermined number of operations of the shafts 37 is required before the opening 96 in the disk is alined with the bore 95 of the collar to permit suction to be applied to the unit B'. Therefore, any desired number of sheets may be removed from the racks 29 for each board removed from the rack 29a and tablets or pads of desired sizes may be assembled.

In the operation of the device, the pick-up units are normally in the position shown in Figure 5, each unit B being spaced from its respective stack of sheets A, and the unit B' being spaced from backboards on the rack 29a. The motor 25 is operating to drive the conveyor belts 19 and to rotate the shaft 48. As the crank arms 47 on the shaft 48 are rotated, the operating shafts 37 are first moved to the left in Figure 1, whereby each pick-up unit is moved longitudinally on the frame toward its respective stack of sheets A, and the unit B' is moved toward the backboards on rack 29a. Such longitudinal movement of each unit moves the nozzle of each unit into contact with the uppermost sheet and board on the respective stacks. As soon as the nozzles of the units B engage the sheets, the cam 59 has moved around to actuate the control valve 57, whereby suction is applied through the suction manifold 49 and to said nozzles. Thus, the uppermost sheet on each stack is picked up by the nozzle of its unit and is held until the shafts 37 are again moved to the right in Figure 1, thereby return-

ing the nozzle to its original position as shown in Figure 5. Upon such return, the valve 57 is actuated by the cam to release the suction and at the same time permit a flow of air under pressure to the air manifold 55. This flow of air is conducted through the hose 54 to each nozzle 34 and serves to blow the sheets from said nozzle. The sheets fall downwardly upon the conveyor belts 19 and since said conveyor is travelling at all times, the sheets which are thus deposited upon the conveyor are carried therealong towards the discharge end of said conveyor.

Thus, all of the units B operate simultaneously to pick up the sheets from the racks 29. The unit B' also is moved but unless the position of the valve disk is such as to aline the opening 96 with the bore 95 of the collar 35*a*, no suction is applied and said unit does not function to remove a backboard from the rack 29*a*. However, as the unit B' is moved upon each actuation of the shafts 37, the valve disk 90 is rotated a predetermined amount by its engagement with the pawl 98, as has been explained. Manifestly, after a predetermined number of sheets have been removed from the racks 29, the opening 96 registers with the bore 95 to permit suction to be applied to the nozzle of the unit B', whereby a backboard is removed from the rack 29*a* and deposited upon the conveyor.

Since all of the pick-up units B are connected with and actuated by the shafts 37, all of said units are operated simultaneously so that one sheet from each rack 29 is deposited in a predetermined order upon the conveyor belts 19. Of course, the unit B' operates with the units B and deposits the backboards on the conveyor in the desired order. It might occur that one of the pick-up units B may fail to pick up a sheet and in such instance it is desirable and almost essential that the apparatus be automatically halted so as to prevent erroneous gathering of the sheets. To accomplish an automatic halting of the apparatus in the event one of the units fails to pick up a sheet of paper, each rod 32 of the unit is provided with a control valve mechanism 60. A valve seat 61 is provided in the end of the rod 32 which engages within one of the collars 35 and a valve member 62 is adapted to engage this seat. The valve member is provided with a stem 63 which extends axially through a spider 64 which is formed in the inner end of a tubular sleeve 65. A cap 66 closes the outer end of the sleeve and the end of the valve stem 63 projects outwardly beyond this cap. A coiled spring 67 surrounds the valve stem and is located between the spider 64 and a diametrically extending pin 68 which is secured in the valve stem within the sleeve 65. The spring 67 constantly exerts its pressure to urge the valve stem outwardly of the cap 66, thereby urging the valve element 62 to an unseated position.

The outer end of the valve stem 63 engages and rides upon the inner surface of an operating bar 69, which bar is slidably supported within suitable bearings 70 which are mounted at the upper ends of the legs 12 of the frame. The bar 69 overlies the frame bar 11 and extends throughout the length of the machine. The bar is provided with a plurality of notches 71 in its inner surface and one notch is provided for each pick-up unit B. Adjacent the notch is a relatively long flat spring 72 (Figure 2).

In operation, when each pick-up unit is spaced from the sheets A, as shown in Figure 5, there is no suction applied to the nozzle and therefore, the spring 67 holds the valve 62 open and also maintains the valve stem 63 in engagement with the inner surface of the bar 69. It is noted that at this time, the valve and stem are partially depressed, being substantially in the position shown in dotted lines in Figure 3. As the pick-up unit is actuated and its nozzle 34 moved into engagement with the uppermost sheet on its respective rack, the stem 63 moves opposite the notch 71 and rides upwardly on the flat spring 72, whereby the valve 62 is moved to a closed position against its seat 61. When the nozzle engages the sheet and suction is applied, the sheet will close the openings in the nozzle 34 and the suction within the rod 32 will be applied to the surface of the valve 62 to hold the same in its closed position, whereby the stem 63 is in a retracted position relative to the bar 69. But, when the pick-up unit moves away from the stack with a sheet adhering to the nozzle 34, the stem 63 will be sufficiently retracted to miss the notch 71 in the bar and will therefore return to its original position on the inner surface of the bar 69.

However, if the nozzle 34 fails to pick up a sheet, the suction within the bore of the rod 32 will be broken, with the result that the spring 67 will move the valve and stem to the position shown in Figure 3. In such position, the stem 63 will ride downwardly on the curved spring 72 and will engage the notch 71 in the slidable bar 69. Under these conditions, the return of the pick-up unit to its original position will result in a sliding movement of the bar 69, such movement being effected only when the nozzle fails to pick up the sheet.

The slide bar 69 has connection with a pivoted switch arm 73 which is associated with an electrical switch 74 mounted on the side of the frame. The switch 74 is connected in the circuit of the motor 25 so that when the bar 69 is moved to operate the switch, the current to the motor 25 is cut off, with the result that the entire apparatus is halted. Thus, it will be seen that the arrangement provides a positive means for halting the operation of the apparatus in the event that one of the pick-up units fails to pick up its particular sheet.

After the sheets are deposited upon the conveyor belts 19, said belts serve to carry said sheets to a stacking table 75 which is disposed immediately below the discharge end of the conveyor. The table 75 forms a part of an ordinary jogger which may be purchased on the open market. This jogger includes adjustable plates 76 and movable plates 77 which are disposed within an opening 78 in the table. An adjustable platform 79 is located below the opening and may be moved upwardly and downwardly by means of a crank 79*a*. The movable plates 77 are connected by means of a lever 80 and a bell crank 81 with an operating bar 82. The opposite end of the bar 82 is pivotally connected to one of the levers 43 which actuates the shafts 37, whereby the jogging mechanism is operated simultaneously with the other apparatus. A guide spring 83 extends from the frame above the discharge end of the conveyor downwardly to the opening 78, whereby the sheets from the conveyor are guided into said opening.

In the operation of the device, the sheets are stacked in the various racks 29 in the order in which it is desired to assemble the same on the platform 79. Obviously, the sheets on one rack differ, usually in color, from the sheets on the

other rack. The conveyor 19 is operated constantly to move at a predetermined rate.

The pick-up nozzles are normally in a position shown in Figure 5 and as the crank 47 rotates to reciprocate the shafts 37, said nozzles are moved into engagement with the uppermost sheets on the various stacks. As each nozzle engages its sheet, the valve 57 is actuated through the cam 59 and suction is applied to the nozzle so that each nozzle picks up its sheet. The shafts 37 are then reciprocated to move the nozzles away from the rack 29 to the position shown in Figure 5, at which time, the valve 57 is again actuated to release the suction on the nozzle and to apply air through the air manifold 55 and the respective hoses 54. Thus, the sheet is deposited upon the conveyor 19. As explained, the pick-up unit B' which is associated with the rack 29a operates to pick up a backboard from said rack only when the valve disk 90 is in a position permitting suction to be applied to the nozzle of said unit.

It is noted that all of the pick-up units operate simultaneously to deposit one sheet from each stack upon the conveyor. The conveyor is arranged to travel at such speed that all of the sheets which have been deposited thereon are delivered to the jogger or receiving table before the pick-up units again operate to deposit additional sheets on said conveyor. In other words, the conveyor is cleared of all sheets before another complete set of sheets is deposited thereon.

In the event that any one pick-up unit B fails to pick up a sheet upon any operation thereof, the valve 62 within each unit is permitted to open because of the release of suction through the nozzle 34, as has been explained. When the valve 62 opens, the projecting end of the valve stem 63 may engage within the notch 71 of the slide bar 69 so that as the unit is moved back to its original position by the shafts 37, the slide bar 69 is moved therewith. This bar, as has been explained, is connected with the control switch 74 so that the switch is operated to shut off the current to the motor 25 and thereby halt the entire apparatus. It is pointed out that gravity is depended upon to drop the sheets from the nozzle and that the air is supplied only as an assurance that said sheets will not stick or adhere to the nozzles. The units need travel only a minimum distance and this makes possible a compact and smaller unit. All of the operating parts are actuated from the single prime mover and this, in itself, greatly simplifies the construction.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

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

1. A gathering apparatus including, a frame, a longitudinal conveyor mounted on the frame, a group of sequent sheet supporting elements mounted across the frame and each adapted to support a plurality of sheets and disposed above and over the conveyor, reciprocating units mounted wholly transversely of the frame adjacent the supporting elements and individually co-acting with the elements to remove individual sheets therefrom, means to release sheets from the units to permit them to deposit on the conveyor in sequent order, a pair of reciprocating members mounted longitudinally on each side of the frame, all of said units being mounted on said members and having yieldable connection therewith, and means for actuating the conveyor and the reciprocating members in timed relation.

2. A gathering apparatus as set forth in claim 1, and means controlled by the reciprocation of the units for varying the operation of the means of one of the units to pick up individual sheets from its correlated element at predetermined intervals with respect to the operation of other units.

3. A gathering apparatus including, a frame, a longitudinal conveyor mounted on the frame, a group of sequent sheet supporting elements mounted across the frame and each adapted to support a plurality of sheets and disposed above and over the conveyor, reciprocating units mounted wholly transversely of the frame across the supporting elements and individually co-acting with the elements to remove individual sheets therefrom, means to release sheets from the units to permit them to deposit on the conveyor in sequent order, a pair of reciprocating members mounted longitudinally on each side of said frame, all of the units being movably mounted on said members and having yieldable connection therewith, means for halting operation of the conveyor and the reciprocating members, and means including elements mounted on the frame and connected with said halting means and co-acting elements carried by some of the units controlled by the sheets to cause said halting means to actuate when one of said units fails to pick up a sheet.

4. A gathering apparatus including, a frame, a longitudinal conveyor mounted on the frame, a plurality of sheet supporting elements mounted across said frame over said conveyor, a pair of longitudinal members movably mounted on the frame on each side of the supporting elements, sheet removing units extending transversely between and movably mounted on the longitudinal members, means for reciprocating said members, and means on the members for imparting limited movement to said units when said members are reciprocated.

5. A gathering apparatus as set forth in claim 4 wherein one of the sheet removing units is provided with means for preventing said unit from removing sheets from its corresponding supporting element, and means set for a predetermined number of operations for causing said last-named sheet removing means to remove a sheet at predetermined intervals.

6. A gathering apparatus including, a frame, a longitudinal conveyor mounted on the frame, a plurality of sheet holders mounted across said frame over the conveyor, a pair of reciprocating bars mounted longitudinally on said frame on each side of the holders, sheet-removing members extending across the frame in front of said holders and having supports at their ends slidable on the bars, suction nozzles carried by the members intermediate their ends, means on said bars for operating the supports to move the nozzles into position to remove sheets from said holders, and means connected to the bars and extending below said conveyor for reciprocating said bars.

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