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[56]

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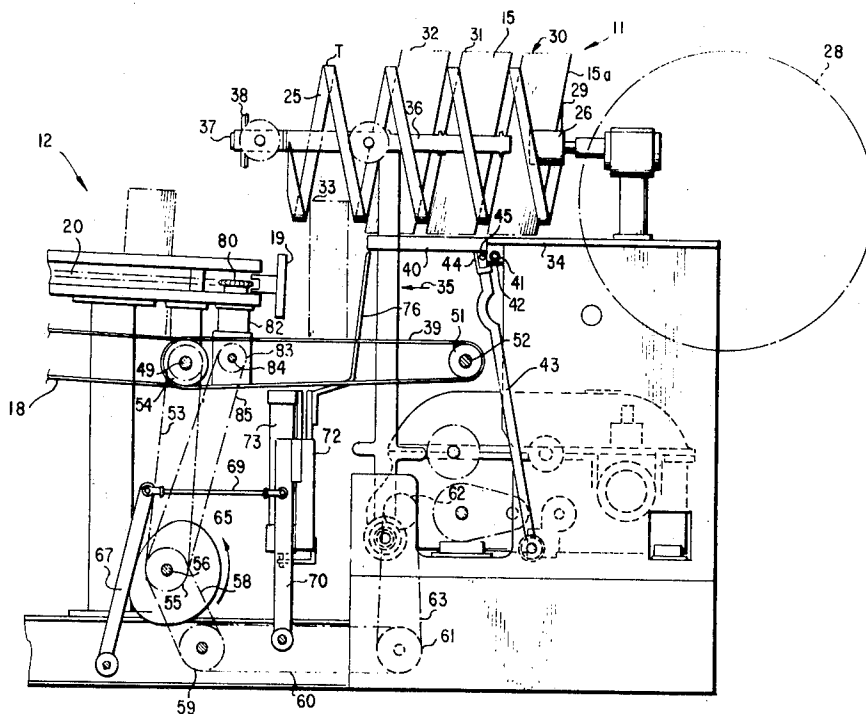
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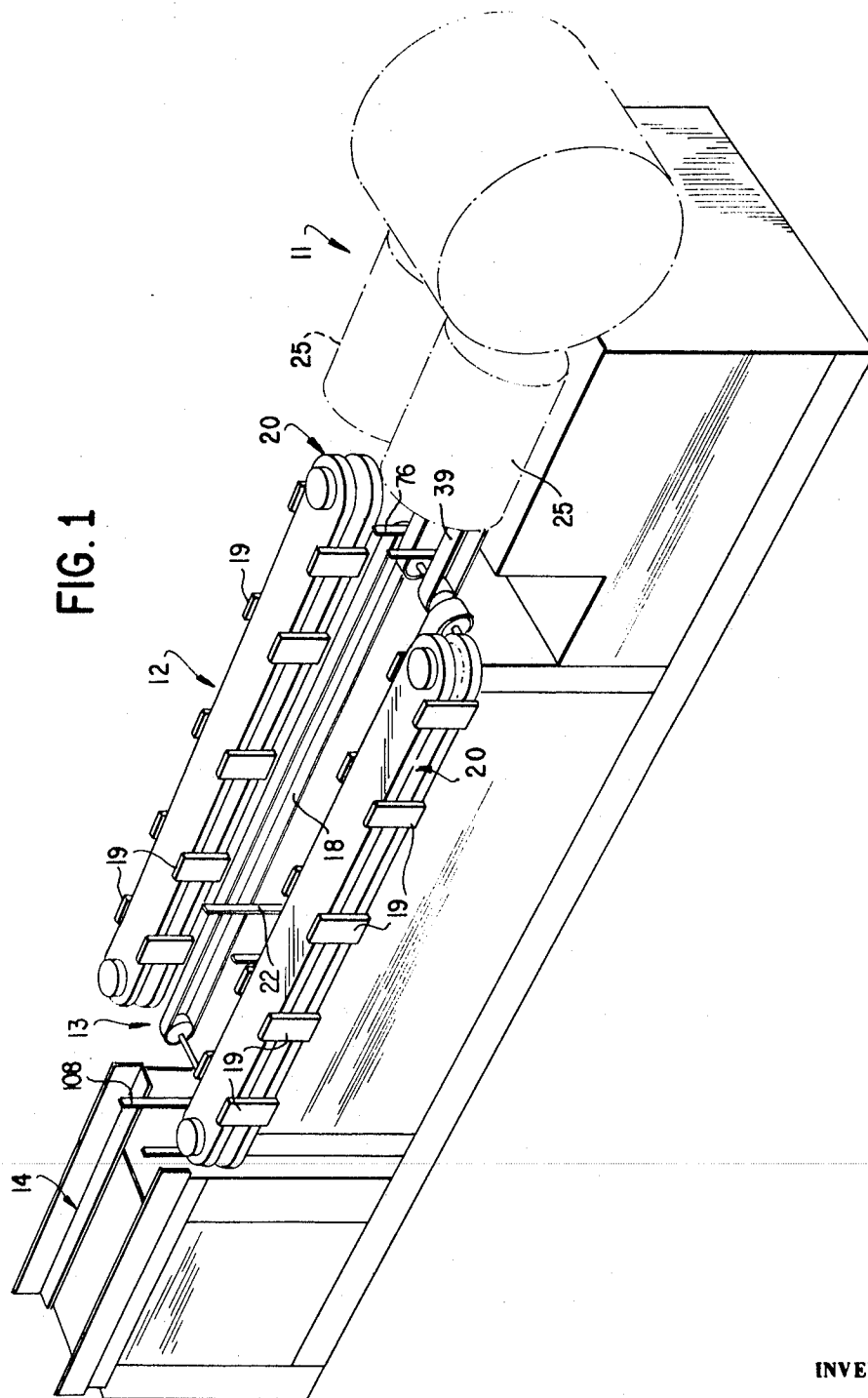
Primary Examiner—Bernard Stickney  
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[54] **AUTOMATIC BAG ACCUMULATING,  
ADVANCING AND CHARGING APPARATUS**  
15 Claims, 10 Drawing Figs.

[52] U.S. Cl. .... **93/93 DP,**  
93/93 M, 198/35, 214/7, 271/87  
[51] Int. Cl. .... **B65h 33/00**  
[50] Field of Search .... **93/93 DP,**  
93 R, 93 M; 198/35; 271/87; 214/7

**ABSTRACT:** An apparatus and method for collecting paper bags as they are being discharged from bagmaking machinery, and for accumulating the same in collated groups of equal bag numbers and charging a predetermined number of bag groups into a bundling machine.





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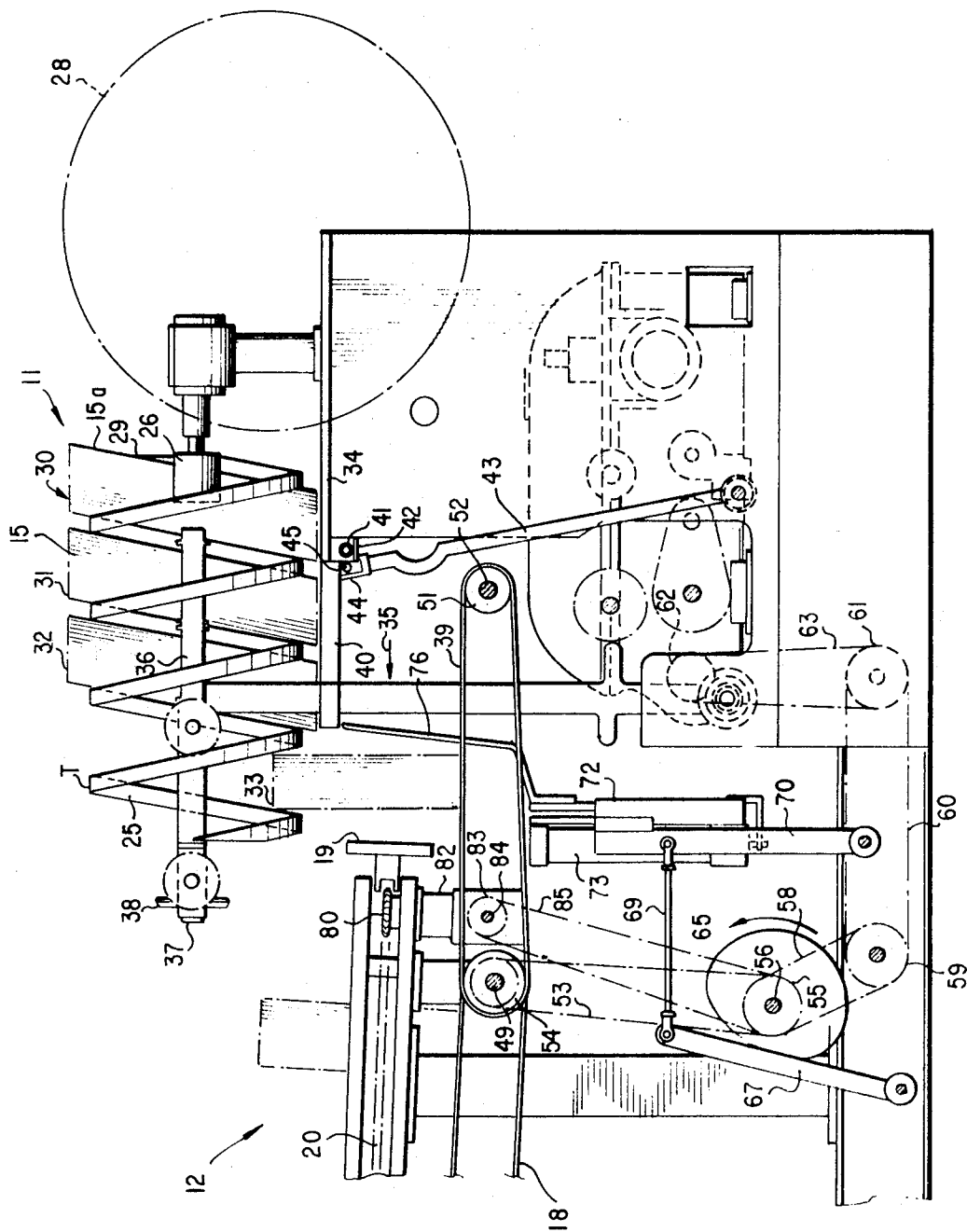
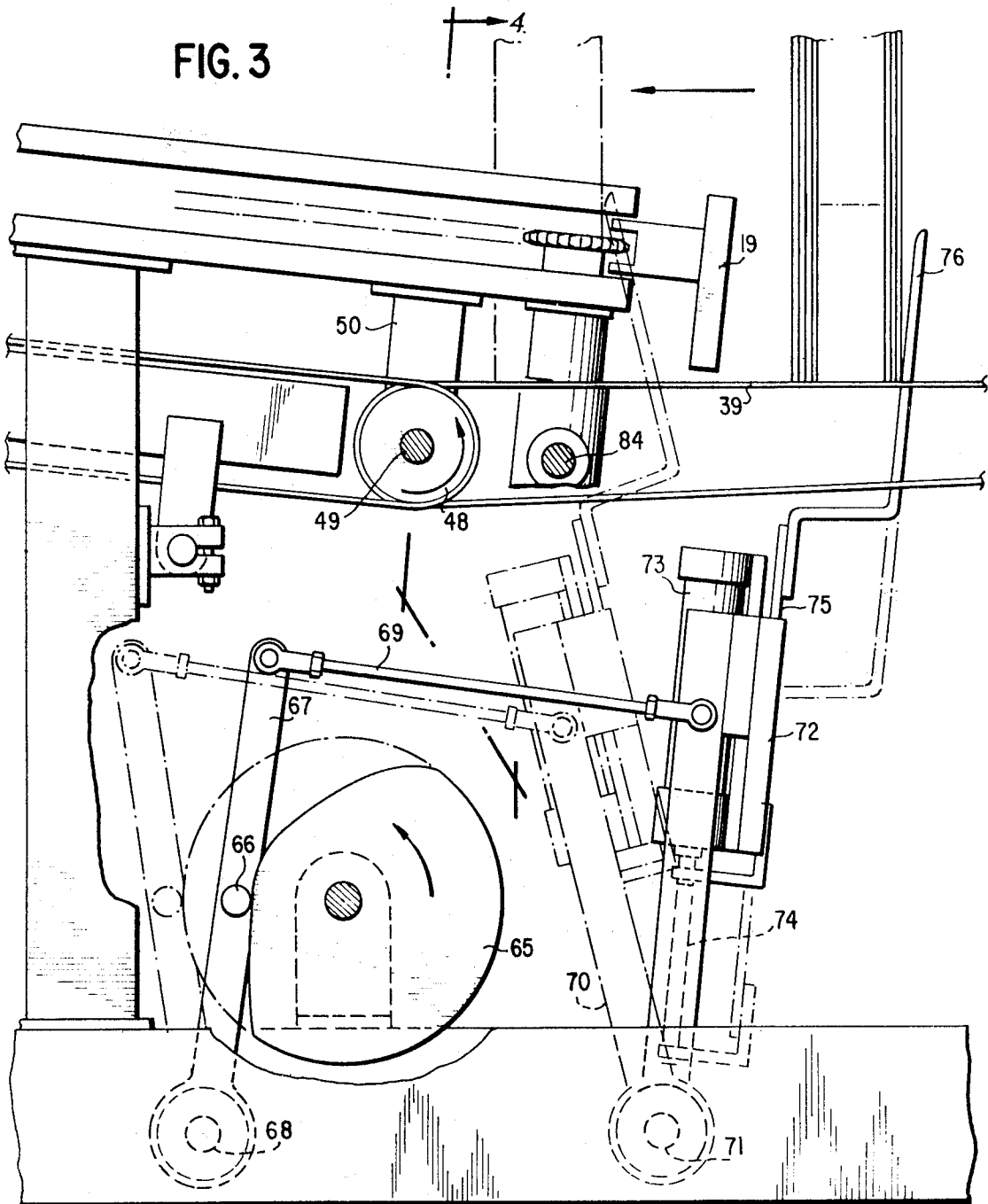


FIG. 2

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FIG. 3



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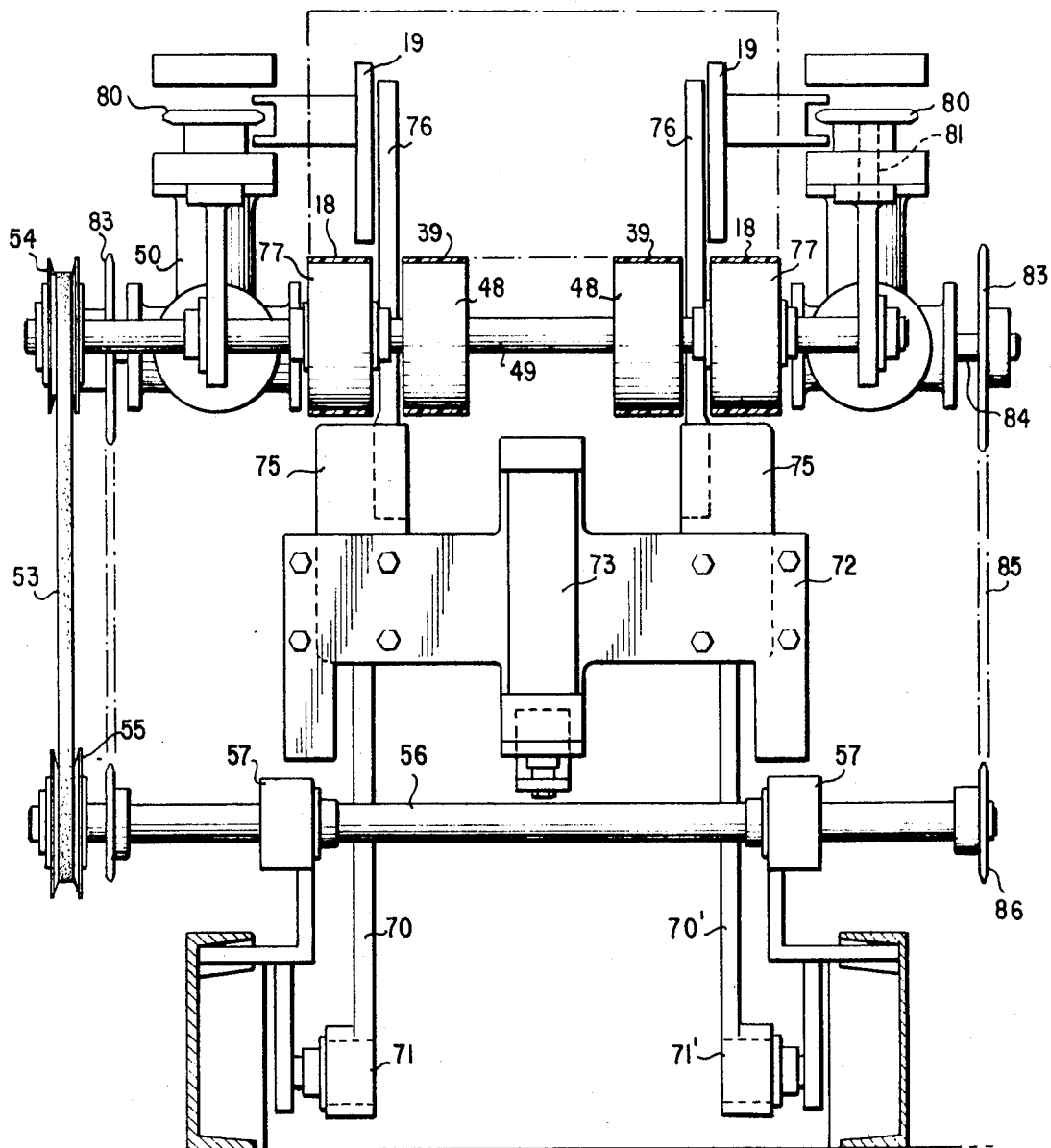
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FIG. 4



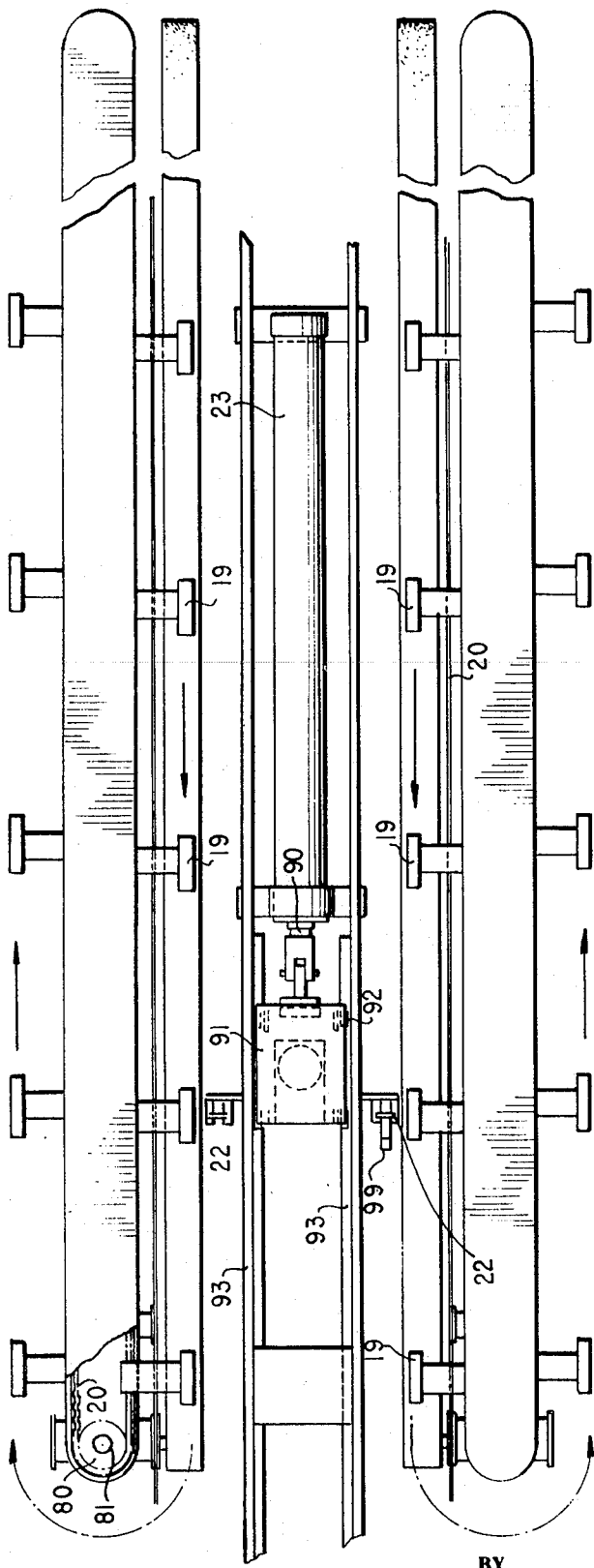
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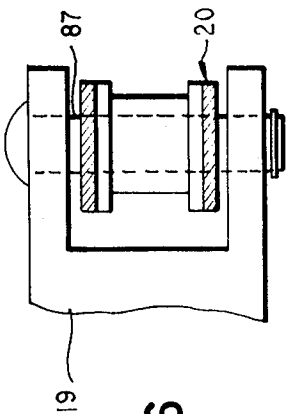


FIG. 6

FIG. 5

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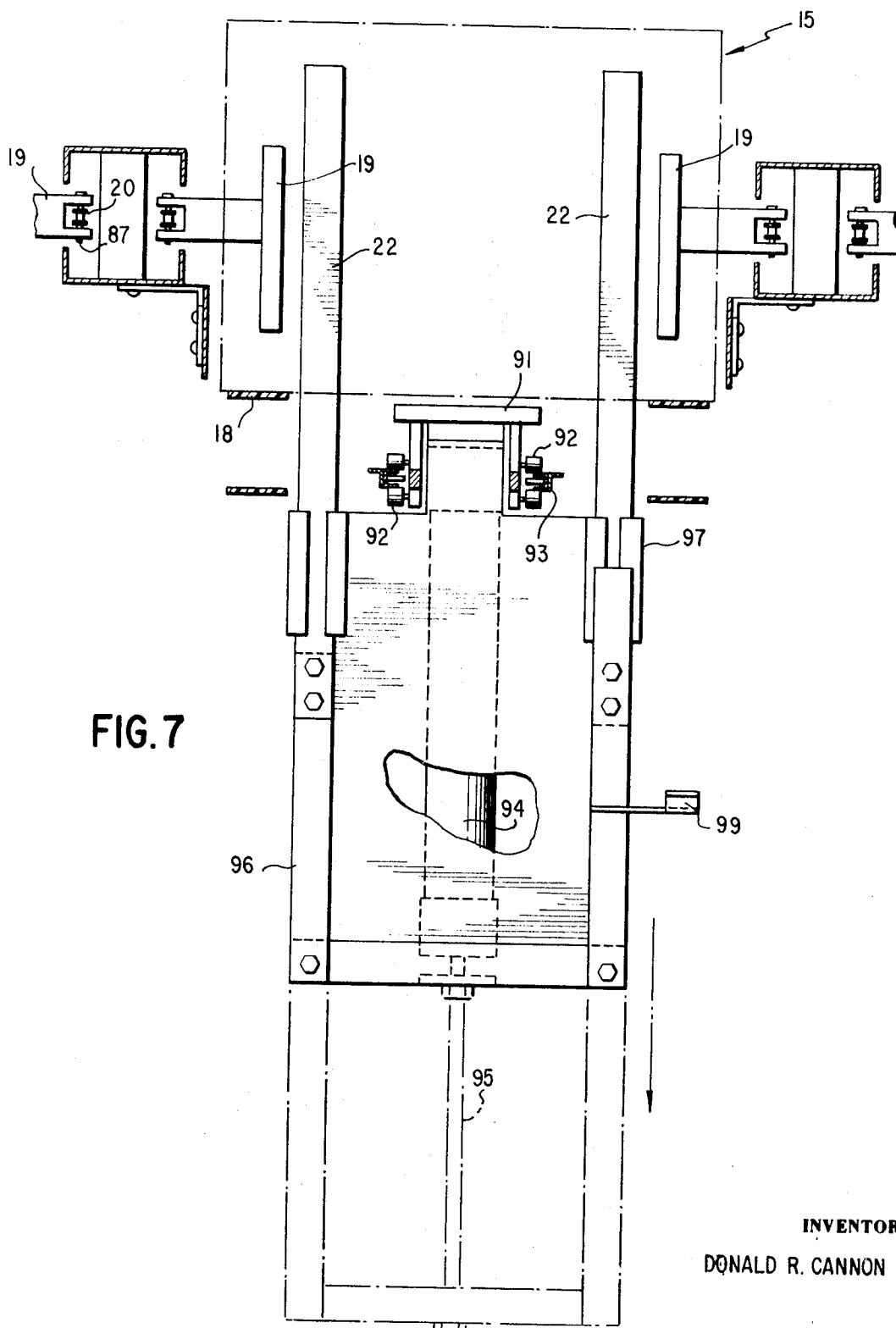


FIG. 7

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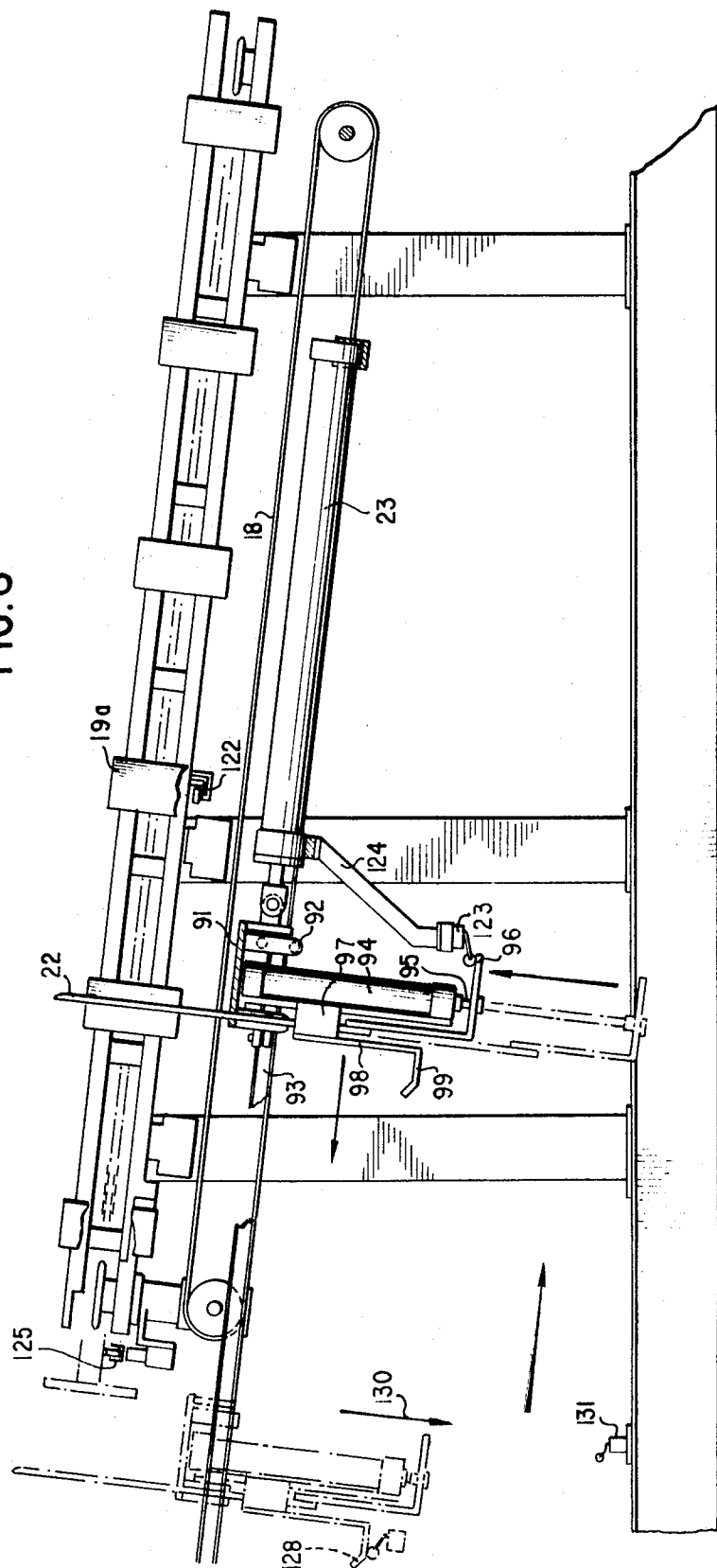
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FIG. 8



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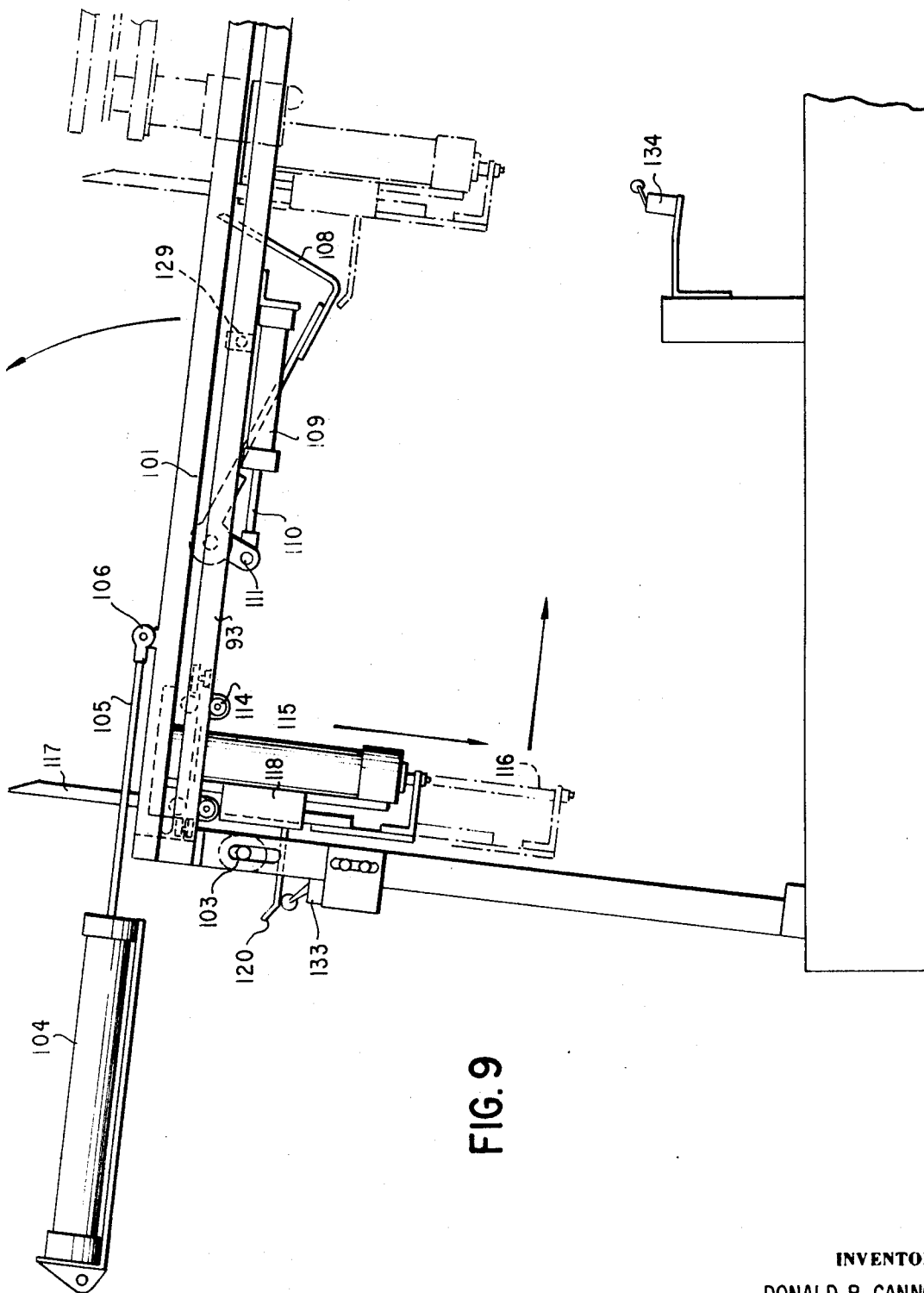


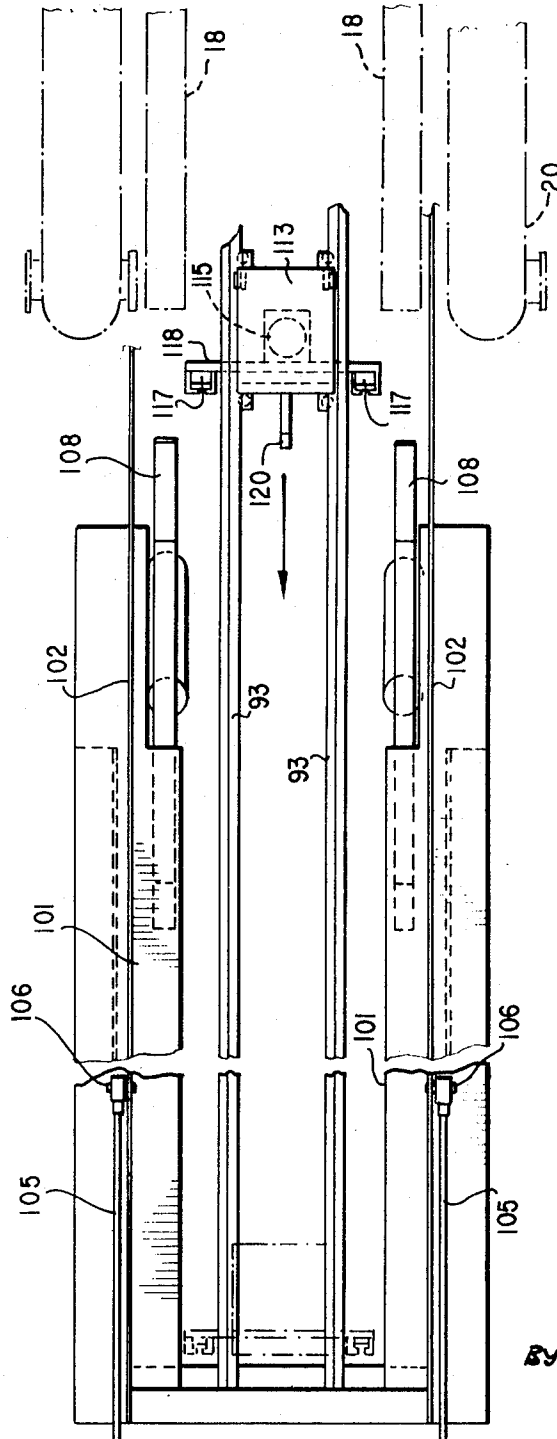
FIG. 9

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FIG. 10



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## AUTOMATIC BAG ACCUMULATING, ADVANCING AND CHARGING APPARATUS

### BACKGROUND OF THE INVENTION

This invention relates generally to a method and apparatus for grouping articles and loading the same into bundling machinery, and, more particularly, to an apparatus for automatically accumulating articles, such as paper grocery bags as they are being discharged from bagmaking machinery, into collated groups, continuously advancing the bag groups to a bundling station, and loading the bag groups into a bag-bundling press positioned therein.

In packaging paper bags of the character described and similar generally flat articles which are somewhat thicker along one edge or end portion than elsewhere, it is common practice to collate or alternate the bags or articles prior to packaging the same so that a predetermined number thereof comprising a "hand," in the case of bags, all have their thicker edges oriented on one direction, an adjacent equal number have their thicker edges oriented the opposite direction, and so on, successively, in alternating fashion, so that a bundle or package of the articles, composed of a plurality of oppositely turned, or collated, groups thereof is of relatively uniform, right rectangular dimensions to facilitate handling during shipment and storage. Accordingly, machinery heretofore has been provided for collating these articles in such a manner that successive ones or groups of the same are alternately turned in opposite direction. In addition, there are machines which also operate to automatically transfer articles, or collated groups of these articles, to the apparatus for packaging the same, for example, in the case of paper bags, to banding devices or bundling presses.

Although they have generally performed in an acceptable manner to group, orient and transfer bags in the manner hereinabove described, these machines nevertheless are subject to a number of problems and suffer from several other disadvantages which make them not entirely satisfactory in their usual handling of the bags and obviate their value when considered in light of projected extensive usage over long periods of time. Most significant among the problems encountered with these machines are those resulting from normal wear and tear. Evidently, this occurs because of the structurally complex nature of the machines wherein, in the usual arrangement, the cycle of the bag-grouping device is for 25 bags and these bag groups are separately loaded into the bundling station, thereby requiring rapid cycling of fingers or blades which separate, maintain separation during collection, transfer and loading, and for advancing and loading the bag groups. The multiple movements of these fingers or blades occurring during each cycle obviously increases the wear on parts and the frequency of repairs thereof.

Additionally, in tiltup loading units heretofore used in such machinery, it has been necessary to mechanically spread or separate the bag-supporting frame members thereof while the unit is being lowered to receive a new load or charge of bags, following each transfer of bags therefrom to the bundling apparatus, in order to prevent the same from being lowered on top of the incoming bags, and subsequently to be redrawn into closer relation for receiving and supporting the incoming bags.

Also, the advancing and charging mechanisms of former machines have been mechanically operated, chiefly through cam-operated drives which have required extensive maintenance and lubrication while yet wearing at a considerable rate.

### SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved method and apparatus for accumulating flat articles which are somewhat thicker along one edge or end portion thereof than elsewhere in groups for forming packages of relatively uniform dimension thereacross and for charging the same into a bundling machine.

Another object of the present invention is to provide an improved apparatus for automatically accumulating flat articles which are thicker along one edge or end portion than elsewhere in groups successively having the thick edges extending in one direction, then in the opposite direction, in alternating fashion, continuously advancing the groups to a bundling station, and loading the groups into a bundling machine therein.

Still another object of the present invention is to provide an improved apparatus for automatically accumulating paper bags in collated groups, advancing the bag groups to a bundling station and charging a predetermined number of the bag groups into a bag-bundling press in the bundling station, which apparatus is simple in construction and requires little maintenance.

Yet another object of the present invention is to provide a relatively simple apparatus for accumulating collated groups of bags and transferring the same to a bundling machine which is not subject to the degree of wear and tear usually encountered by devices having the same functional characteristics.

A further object of this invention is to provide an apparatus of relatively simple construction for accumulating and collating bags and transferring the same to a bundling machine, the apparatus being characterized by having a substantially small number of movements during each cycle and thereby being less subject to wear and tear than existing devices for accomplishing the same end.

Yet a further object of the invention is to provide an improved method of collecting articles which are thicker along one edge or end portion and arranging and packing the same in bundles having relatively uniform dimensions thereacross.

A still further object of the invention is to provide an improved method of collecting paper bags from bagmaking machinery and charging the same into a bag-bundling press in such a manner as to ensure relatively right rectangular bundles thereof.

The foregoing objects are achieved, according to one aspect of the invention, by collecting the bags in groups of a predetermined number, turning or orienting successive groups with the ends of the bags in one being disposed in one direction, the ends of the bags in the next being disposed in the opposite direction, and so on, in alternating fashion, accumulating a preselected number of such groups and advancing the same in separated sequence to a tiltup loading unit of a bundling machine, and charging the bag groups in such preselected numbers into the loading unit. In a preferred embodiment, an advancing section for conveying the bag groups to the loading unit features separating lugs mounted on chain drives disposed on opposite sides of a pair of conveyor belts, which separate the bag groups thereon and also serve to trip a switch disposed in the path of travel thereof for initiating operation of a set of air-operated charger fingers positioned below the conveyor belts for elevating the same behind the most forward bag group and pushing the bag group onto the loading unit. Outboard bag group-retaining fingers carried by the loading unit pivot downwardly out of the path of the bag group being pushed thereon and are raised to retain the bag group in the loading unit as the charger fingers are retracted. After a predetermined number of bag groups are charged into the loading unit, the loading unit tilts upwardly to deliver the bags thereon to the bundling machine. The apparatus is designed to operate automatically and the controls therefor consist primarily of air-operated advancing fingers in the accumulator section, charger fingers in the charging section, and retainer fingers and backup fingers in the loading section, all of which are effective to actuate limit switches or air valves in the course of their movements for controlling the application of air pressure in the desired sequence thereto.

### BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, as well as additional features and attendant advantages of the present invention will be more readily ap-

preciated as the same becomes better understood from the following detailed description when considered in conjunction with the accompanying drawings, wherein like reference numerals designate like or corresponding parts throughout the several Figures, and in which:

FIG. 1 is a broken perspective view of a bag-charger apparatus embodying the invention, the charger being shown in association with a bag-accumulating machine for depicting the overall operational sequence and general steps in the group-collating and charging procedure;

FIG. 2 is a side view of the bag-accumulating machine showing the introduction end of the bag-charging apparatus embodying the invention wherein groups of bags are positioned on a short conveyor by the bag accumulator;

FIG. 3 is an enlarged view of the machinery illustrated in FIG. 2, showing in greater detail a group of bags being engaged by a special advancing finger mechanism embodied within the invention for advancing the bag group assembled by the accumulating machine from the short conveyor onto a long conveyor wherein the bag groups are kept spaced apart by separating lugs carried by an adjacent chain drive;

FIG. 4 is an elevational sectional view taken along the line 4-4 of FIG. 3 illustrating the common drive arrangement of the conveyors and the chain of the separating lugs;

FIG. 5 is a plan view of the charger apparatus showing in particular the long conveyor, the chains disposed on each side thereof for moving the separating lugs therewith, and the cylinder for advancing the charging fingers to move a group of bags from the long conveyor onto a tiltup loading unit of a bundling device;

FIG. 6 is a sectional view of a separating lug connection on the chain drive therefor;

FIG. 7 is a transverse sectional view of the apparatus shown in FIG. 5, taken along the line 7-7 thereof, showing the charging fingers being raised from below the long conveyor belts upwardly between the forward bag groups thereon, and being partly broken away to show the cylinder affixed to the charging fingers for elevating and lowering the same;

FIG. 8 is a longitudinal view in section of the bag group-advancing conveyor mechanism and the charger apparatus, showing in diagrammatic fashion the moving sequence of the charging fingers as they cyclically are raised between the forward pair of separated bag groups, advanced to transfer the forward bag group onto the tiltup unit, lowered below the conveyor level and returned to the starting position still below the conveyor;

FIG. 9 is a side view, partly in section, of the tiltup loading device showing the outboard bag group-engaging fingers thereon and the backup fingers against which the bag group is charged by the charging fingers; and,

FIG. 10 is a plan view of the tiltup loading device shown in FIG. 9.

#### DESCRIPTION OF A PREFERRED EMBODIMENT

Prior to describing the apparatus in detail, it may be convenient to consider a general overall description thereof and, in this connection, particular reference is made to FIG. 1. In its entirety, the apparatus may be thought of as comprising four sections generally identifiable as a bag-accumulator or collection section 11, a bag group-advancing section 12, a bag-charging section 13 and a tiltup loading section 14 for loading the assembled bag groups into a bundling machine, not illustrated. The bags 15 may be fabricated on standard machinery in a conventional bagmaking line, which machinery usually includes a drum or cylinder from which bags 15 are discharged along a predetermined path in a substantially endless stream comprising a continuous succession of bags all oriented in the same direction. In the present scheme, the bags 15 are received within the bag-accumulator or collection section 11 which serves to collect the bags being discharged in succession from the fabricating drum and to divide the bags into groups, or hands, which groups are alternately rotated to

change the attitude or position of the bags therein such that successive groups are collated or turned so that the bags in one have the bottoms thereof facing in one direction and the bags in the succeeding group have the bottoms thereof facing in the opposite direction, whereby any bundle of a plurality of such bag groups is of relatively uniform, right rectangular dimensions which may be conveniently handled during banding of the bundle and subsequent shipment and storage thereof.

The bag group-advancing section 12 operates to push a predetermined number of the bag groups assembled by the accumulator 11 onto a long conveyor unit 18 and has a plurality of equally spaced separating lugs 19 secured to a set of conveyor chains 20 which are positioned along each side of the path of the conveyor 18 and are commonly driven therewith for making entry into the path of the advancing bag groups to thereby maintain successive predetermined numbers of the bag groups in spaced relation from one another. Thus, for example, the bags 15 may be divided into groups of 250 as they are pushed onto the conveyor 18 and are separated during their travel along the conveyor path from adjacent groups of 250 bags by the separating lugs 19.

At the terminal end of the conveyor 18, a set of charging fingers 22 which are cyclically elevated from below the level of the conveyor path into the space separating the most forward groups of 250 bags, and laterally between the pair of separating lugs 19 separating these groups, and an air cylinder 23 disposed below and substantially parallel with the conveyor 18, which is operatively connected with the charging fingers for driving the same forward in the direction of travel of the bags, comprise the bag-charging section 13, and are operative for pushing the bags in properly collated groups of 250 into the fourth, or final, section which is the tiltup loading device 14. Preferably, as will be set forth hereinbelow, the tiltup loading device 14 receives two such groups of 250 bags, or 500 bags, before loading the same into a bundling machine.

Referring more particularly now to FIG. 2, for a more detailed description of the bag-accumulator section 11, a pair of spaced, phased, cooperating helices 25, only one of which is shown, are supported and rotatably driven in opposite hand fashion by parallel-mounted stub shafts 26. Each of the helices 25 has a plurality of turns T with a pitch equal to or greater than the thickness of a predetermined number of bags 15 which in the present embodiment is selected to accommodate 25 bags defining a bag group. The rotational speed with which the shafts 26 drive their mating helices 25 is selected and timed relative to the speed with which the bags 15 are supplied thereto from the drum 28 such that the upstream ends or tips 29 of the helices periodically intercept or cut off a downstream bag, such as the bag 15a, from the next upstream bag to define a bag group indicated by the reference numeral 30.

After the cutoff or definition of bag group 30, this group and downstream groups 31, 32 and 33 (FIG. 2) are advanced along a flat receiving plate 34, in the direction shown by the arrow labeled 35, by the continuous rotation of the helices. At this stage, the individual bags 15 in each group are disposed in a vertical position with the bag butts, or bottoms, down and the open ends up.

At the downstream end of each helix 25, there is a shaft 36 having one end partially received within its respective helix and being rotatably supported at its other end by a driving stub shaft 37 having a bevel gear connection 38 therewith. The shafts 36 are connected with a suitable control means, not shown, for periodically actuating a mechanical clamping device supported on each shaft end within its respective helix to cause the same to grasp and rotate the bag groups from a vertical position to a horizontal position in alternating fashion while the bag groups are being advanced on the plate 34 by the helices, and thereafter to release the bag groups onto a pair of parallel, slowly moving conveyor belts 39. In FIG. 2, for example, bag group 33 has been rotated on its side and rests on the belts 39. Although the controls of the bag accu-

mulator 11 are not illustrated herein, the bag accumulator of the present invention is substantially the same as that disclosed in U.S. Pat. No. 3,415,351, issued Dec. 10, 1968, to Walter S. Ware and Donald R. Cannon, and it is to be understood that the same controls may be used in conjunction with the accumulator section of the present invention.

Thus, as fully described in the aforementioned patent to Ware, et al., a set of mating reciprocating rails 40 being flush with the top surface of the plate 34, in the extended position shown in FIG. 2, will provide an extension of the plate 34. The rails 40 are guided by rollers 41 in cooperation with tracks 42 suspended from the bottom side of the plate 34 and are cast from the extended position to a retracted position by a crank arm 43 whose bifurcated end 44 engages a carrier rod 45. Gradual and cyclic movement of the respective rails 40 from the retracted position to their extended position at a linear speed corresponding to the linear advancement of the bag groups being conveyed downstream by the constantly rotating helices 25 serves to provide support for the downstream bag groups prior to the depositing of the same on the short conveyor belts 39.

Operatively, the helices 25 advance the bag groups along the plate 34, and, at the beginning of each third revolution of the helices, downstream motion is imparted to the rails 40 providing support for the bag groups after they advance beyond the end of the flat plate 34. In timed sequence and after bag groups 33 and 32 are entirely supported by rails 40, the clamping device is actuated to clamp these bag groups. Rails 40 are then retracted within the flat plate 34, clearing the bottoms of bag groups 33 and 32, and the clamping device operates to rotate the bag groups to a horizontal position before releasing them upon the slowly moving conveyor belts 39.

In similar fashion, but in opposite hand, the succeeding two groups of bags are grasped and rotated to a horizontal position, and released upon the conveyor belts 39. Thus, it is apparent that the butts or bottoms of bag groups 31 and 32, comprising 50 bags in this embodiment, project in one direction while the butts or bottoms of the succeeding pair of bag groups, including bag group 30, and comprising another 50 bags, project in the opposite direction after deposit upon belts 39.

In describing the bag group-advancing section 12 of the apparatus, reference will be made in particular to FIGS. 2 thru 8.

As indicated hereinbefore, the accumulator section 11 is operative on the bags 15 being discharged from the drum 28 for collecting these bags and dividing them into groups of 25, and subsequently depositing successive pairs of these divided groups, or 50 bags in number, onto the short conveyor belts 39, the first 50 bags being turned with their butt ends disposed in one direction, the next 50 bags having their butt ends facing in the opposite direction, and so on, in alternating fashion.

The parallel, endless conveyor belts 39 are respectively entrained about sheaves or pulleys 48, which are keyed to a transverse shaft 49 journaled for rotation in supporting components 50 rigidly related to the frame structure of the apparatus, and about idler sheaves or pulleys 51 disposed in spaced relation on another shaft 52 mounted parallel to the driving shaft 49. The sheaves 48 are therefore powered through the transverse shaft 49 which is rotatably driven by a belt 53 entrained over a pulley 54 secured on one end of the shaft 49. Belt 53 is also wound about a pulley 55 mounted on one end of a transverse driving shaft 56 journaled for rotation in components 57 of the frame structure. As shown in FIG. 2, rotation of the shaft 56 is achieved through a driving belt 58 entrained about the pulley 55 and a driving pulley 59 therefor, which, in turn, is driven by a belt connection 60 entrained about a driving pulley 61 powered by another driving pulley 62 and belt 63.

The pulley 55 is selected and timed for making one revolution to each two revolutions of the helices 25, thereby accommodating 50 bags during each revolution. Referring now particularly to FIGS. 2, 3 and 4, there is shown a cam member 65 geared to the shaft of the pulley 55 and having a rotational

ratio of 1 to 5 therewith, which contacts a cam follower 66 on a rocker arm 67 pivotally mounted at one end of a shaft 68 rotatably journaled in bearings in the frame structure of the apparatus. A link 69 has its ends pivotally connected to the other, or free, end of the rocker arm 67 and to another rocker arm 70, which, in turn, is pivotally mounted at one end about a shaft 71 also rotatably journaled in bearings in the frame structure.

Referring now to FIG. 4, the other end of the rocker arm 70 is secured to an elongate plate member 72, and it may be seen that the side of the plate member 72 opposite that side being viewed in FIGS. 2 and 3 is connected to an identical rocker arm 70' totally supported on an opposite end identical shaft 71' rotatably journaled in the frame structure on the other side of the apparatus.

The plate member 72 supports an air cylinder 73 having a piston rod 74 rigidly connected at one end with supports 75 offset from the piston rod 74 and slidably disposed in channels or slots provided in the plate member 72. A pair of advancing fingers 76, one being secured to each of the slidable supports 75, are movable with the supports and the piston rod 74 carrying the same, and are thereby operable for being raised from a position below the level of the short conveyor belts 39, as shown in dotted line fashion in FIG. 3, to a position above these belts along the outside edges thereof.

Thus, it will be understood that the bags 15 are laid down in groups of 50, with bottoms reversed, upon the short conveyor belts 39 and, after each 10 revolutions of the helices 25, or after 250 bags have been deposited on the belts 39, the air-operated advancing fingers 76 raise on either side of the belts 39 and behind these bags, whereupon the cam member 65 engaging the cam follower 66 on rocker arm 67 causes the rocker arm to be pivoted in the direction of travel of the conveyor belts 39, and thereby causes the advancing fingers 76 to be moved in the same direction, pushing the bags forward from the short conveyor belts 39 onto the long conveyor 18.

It will be observed in FIG. 4 that the belts 18 of the long conveyor are entrained about driving sheaves or pulleys 77 which are keyed to the same driving shaft 49 as are the short conveyor belts 39, and positioned parallel to and just outside the belts 39. Thus, the long conveyor belts 18 and the short conveyor belts 39 are being driven at the same speed.

Referring primarily to FIGS. 2 and 4, the drive for the hereinbefore-described conveyor chains 20 carrying the separating lugs 19 may be observed as comprising horizontally disposed sprockets 80 securably affixed to upright shafts 81 rotatably mounted in support components 82, which are positioned on each side of the conveyor belt paths and rigidly related to the frame structure of the apparatus, and being drivingly connected through a right angle gear box, or bevel gear arrangement, not shown, with vertically disposed sprockets 83 rotatable supported on shafts 84 also journaled for rotation in the frame components 82. Chains 85 are entrained about the sprockets 83 and about drive sprockets 86 therefor which are mounted on the transverse driving shaft 56. Since the shaft 56 also accommodates the driving belt 53 for the conveyor belts 18 and 39, it may be readily appreciated that the conveyor chains 20 for carrying the separating lugs 19 are operated at the same speed as these conveyor belts, and thereby control the movement of the lugs so they will turn the corner and make entry between the groups of 250 bags at the proper time, or immediately following the operation of the advancing fingers 76 for pushing the bags onto the long conveyor belts 18. The oncoming bags are held back by the helical spirals 25 on the accumulator section 11 while the separating lugs 19 make entry into the conveyor path.

In FIG. 6, a detailed view of the connection between the lug 19 and the chain 20 is shown. The lug 19 has an integral arm portion extending therefrom which is provided with a substantially U-shaped opening in the free end thereof and a vertically disposed pin 87 passes through the leg portions of the U-shaped member defining this opening and through the chain 20.

Referring now particularly to FIGS. 5, 7, and 8, for a description of the bag-charging section 13, it is evidenced that the path of travel of the conveyor belts 18 is slightly in the direction of travel and that the air cylinder 23 is mounted therebelow in parallel relation therewith, being securably affixed to the frame structure of the apparatus. A piston rod 90 slidably disposed in the piston cylinder 23 is connected with a vehicular support 91 having upper and lower wheels or rollers 92 for engaging rails 93 and permitting rolling movement thereon in a path determined thereby. The vehicle 91 supports a substantially vertically oriented air cylinder 94, which is displaceable therewith during movement of the vehicle, having a piston rod 95 slidable therein which carries a flat L-shaped member 96 to the vertically oriented leg of which is secured the charging fingers 22. The charging fingers 22 move in slots or grooves in brackets 97 affixed to the cylinder 94 and one of these brackets also supports a depending projection 98 having a forwardly extending tab member 99 integrally formed thereon.

Before describing the operation of the bag-charging section 13, the tiltup loading section 14 will be described, since the controls for the two sections are substantially interconnected.

Referring, therefore, to FIGS. 9 and 10, it may be seen that the tiltup loader comprises a pair of oppositely disposed beam-like frame structures 101 which receive the bags between upright sidewall guides 102 integrally formed thereon and are secured together for movement as a unit about a pivot point 103 by any suitable power device, such as, for example, the air cylinder 104 for moving rods 105 in a reciprocable path, these rods being pivotally connected at points 106 to the beam structures 101 for permitting the tiltup unit to be pivoted upward about the pivot 103 upon retraction of the rods 105 to load the bags thereon into a bundling or bailing apparatus and, upon extension of the rods 105, to lower the tiltup unit back into its original position for receiving a new load of bags.

Pivotally attached to the loading beams 101 are a pair of outboard fingers 108 which act as retaining means for keeping the bags loaded into the unit during upward movement thereof into the bundling position and for preventing the bags from falling or separating during intermediate stages of the loading of the unit. The outboard fingers 108 are substantially L-shaped in configuration and are pivotally attached at one end to the loading beams 101 for operation by an air cylinder 109 having a rod 110 connected thereto through a link 111 for raising the retaining portion, or legs, of the fingers 108 into the path of travel of the advancing bags wherein they are disposed just outside the paths of travel of the charging fingers 22, and for lowering these retaining legs below the path of travel of the bags to permit additional bags to be pushed by the charger fingers 22 onto the tiltup loading unit.

The rails or tracks 93 extend into the region of the tiltup loading section 14, being disposed therein just below the level of the supporting portions of the pivotal beams 101. In this region, the tracks 93 support a trolley 113 for reciprocable movement thereon between the rear and front ends of the tiltup loading units via trolley wheels or rollers 114 cooperably disposed above and below the tracks 93. The trolley 113 carries an air cylinder 115 having a piston rod 116 reciprocably movable therein, one end of the rod 116 supporting a pair of fingers 117 offset from the cylinder for parallel movement relative thereto in grooves or slots formed within a bracket member 118 secured to the cylinder. Also affixed to the bracket 118 is a forwardly extending projection or tab 120, the purpose of which will be set forth hereinbelow.

For the purpose of permitting a better understanding of the invention, the various control elements will be set forth in describing the overall operation of the apparatus.

Thus, the bags are collected in the accumulator section 11 in groups of 50 in number, which are alternately turned with the bottoms of first one group being turned in one lateral direction and the bottoms of the next succeeding group being turned in the opposite direction, and are deposited on the short conveyor belts 39. After 250 bags have been deposited

on the conveyors 39, the air-operated advancing fingers 76 raise and are pulled forward by the cam-operated arm 69 for pushing the bags forward onto the long conveyor belts 18. The oncoming bags are held back by the helical spirals on the accumulator section 11 during this movement, while the separating lugs 19 on the conveyor chains 20 make entry behind the bags in the group of 250. At this stage, the advancing fingers 76 are lowered with the piston rods 74 as the same is extended from within the air cylinder 73, and the air cylinder is returned to its original position, being rotated through a predetermined cranking angle by the movement of the rods 67 and 69.

Referring again to FIG. 8, after the bags have been carried a short distance by the long conveyor belts 18 and the separating lugs 19, one of the separating lugs, indicated by the reference numeral 19<sub>n</sub>, contacts and actuates a limit switch 122 which operates to apply pressure to the air cylinder 94, thereby withdrawing the piston rod 95 into the cylinder 94 and causing the charger fingers to be raised behind a group of bags approaching the terminal end of the conveyor belts 18. This upward movement of the charger fingers 22 brings the L-shaped member 96 into contact with a limit switch 123 which is carried by a support 124 depending from the frame structure of the apparatus, thereby actuating the air cylinder 23 to extend the piston rod 90 from therewithin. Displacement of the piston rod 90 causes the vehicle 91 to be moved on the roller network 92 along the tracks 93, carrying with it the air cylinder 94 and the charger fingers 22, causing the latter to push against the group of 250 bags forwardly disposed thereof and urging the same against the separating lug in front the group of bags in the direction of the tiltup loading unit 14. As the separating lugs 19 immediately disposed in front of the group of bags being pushed by the charger fingers 22 turn the corner, they actuate another limit switch 125 associated with the air cylinder 109 for causing the outboard fingers 108 to drop, or be pivoted downwardly (FIG. 9). Accordingly, as the separating lugs 19 are removed from in front of the group of bags and the outboard fingers are lowered below the level thereof, the charger fingers 22 push the group of bags numbering 250 onto the supporting beams 101 of the tiltup loading section 14. Backup support means are provided for these bags as they are pushed onto the tiltup loading device by the trolley fingers 117, thereby causing the trolley 113 carrying these fingers to be moved a given distance along the inclined path of the tracks 93.

When the piston rod 90 has been fully extended, the vehicle 91 will have moved along the track network 93 to a point where the projection or tab 99 carried thereby contacts and actuates another limit switch 128, which is operative to raise the outboard fingers 108 back into position behind the group of bags that has just been pushed onto the tiltup loading device for restraining these bags and preventing them from falling backward upon removal of the pressure of the charger fingers 22. During the course of their movement, the outboard fingers 108 contact and the actuate another limit switch 129, thereby operating on the air cylinder 94 to lower the charger fingers 22 as indicated by the arrow 130 in FIG. 8. At the bottom of the vertical path of travel followed by the L-shaped member 96 during lowering of the charger fingers 22, a limit switch 131 is actuated thereby for causing operation of the air cylinder 23 to retract the piston rod 90 and the vehicle 91 connected thereto.

When a second group of 250 bags are displaced onto the tiltup loading unit, the backup or trolley fingers 117 are pushed back until the tab 120 thereon contacts a limit switch 133 to actuate the same for operating the air cylinders 104 and 115 for lowering the trolley fingers 117 and for raising the tiltup unit toward a bundling machine, not shown. When the tiltup unit is lowered for starting a new cycle, the trolley 113 rolls down the inclined tracks 93 and, at the end of its travel, it contacts and actuates another limit switch 134 which is operative to raise the trolley fingers into its normal backup position. Although not shown, it is understood that the tiltup loading device has other support means at the rear end thereof for

sustaining the bags thereon when completely loaded and during the tiltup phase of its operation.

While in the foregoing specification an embodiment of the invention has been set forth in considerable detail for purposes of making a complete disclosure thereof both as to its method and apparatus aspects, it will be apparent to those skilled in the art that numerous changes may be made in such details without departing from the spirit and principles of the invention. Accordingly,

What is claimed and intended to be covered by letters patent is:

1. In combination with a bag-forming machine, an accumulator for collecting bags as they are being discharged from said bag-forming machine and dividing the said bags into groups of equal number, and including means for collating successive groups into an end-for-end orientation; means for successively advancing a preselected number of said bag groups along a predetermined path and for maintaining each of said preselected number of bag groups separate from each succeeding preselected number of bag groups during the advancement thereof; and means for moving as a unit the preselected number of said bag groups most advanced along said predetermined path from said advancing means into a loading unit of a bundling press.
2. The combination of claim 1 wherein said advancing means comprises a receiving station for receiving said collated bag groups from said accumulator, a main conveyor positioned between said receiving station and said loading unit and defining said predetermined path therebetween, and a bag group-engaging device disposed adjacent said receiving station and operably connected with said accumulator for movement in one direction to push said preselected number of said bag groups from said receiving station onto said conveyor and in another direction for clearing said receiving station to permit the collection therein of a successive preselected number of said bag groups.
3. The combination of claim 2 wherein said advancing means further comprises a plurality of separating devices movably disposed in a predetermined, continuous and endless path adjacent said conveyor, part of which path is within and parallel to the path of travel of said preselected number of said bag groups being carried by said conveyor, said separating devices being spaced apart a predetermined distance substantially equal to the thickness of said preselected number of said bag groups, and means for driving said conveyor, said separating devices and said bag group-engaging device at a preselected, coordinated speed.
4. The combination of claim 3 wherein said separating devices are carried by at least one conveyor mechanism which is disposed on at least one side of said bag group conveyor.
5. The combination of claim 2 wherein said receiving station is at least one conveyor belt and said bag group-engaging device is a finger carried by an air cylinder positioned below said conveyor belt, said finger being vertically movable by said air cylinder for being positioned below said conveyor belt during collection of said preselected number of said bag groups thereon or above said conveyor belt for engaging said bag groups, and said air cylinder being movably connected with said conveyor belt drive for moving said finger to push said preselected number of bag groups onto said main conveyor.
6. The combination of claim 3 wherein said moving means comprises at least one charger finger, a first air cylinder disposed below said main conveyor having a rod supporting said charger finger for moving the same vertically to raise the charger finger into the path of said advancing bag groups and for lowering said charger finger out of said path,

a second air cylinder disposed below said main conveyor and having a rod extendable in a line parallel with said predetermined path, and

means connecting said rod of said second air cylinder with said first air cylinder for moving said first air cylinder therewith for thereby pushing said charger finger against said most advanced preselected number of said bag groups to move the same into said loading unit.

7. The combination of claim 6 wherein said connecting means between said second air cylinder rod and said first air cylinder comprises a wheeled vehicle movably disposed on a set of tracks positioned below and parallel with said main conveyor,

said first air cylinder being carried by said wheeled vehicle, and

said second air cylinder extendable rod being connected at its free end to said wheeled vehicle for moving the same on said tracks.

8. The combination of claim 7, further including means for controlling said moving means comprising:

means responsive to movement of a separating device past a predetermined point in said path of travel thereof for controlling the supplying of air under pressure to said first air cylinder for causing said at least one charger finger to be raised between the two most forward of said advancing preselected numbers of said bag groups,

means responsive to movement of said charger finger-supporting rod of said first air cylinder in an upward direction for controlling the supply of air under pressure to said second air cylinder for moving said rod thereof and thereby moving said wheeled-vehicle on said tracks in the direction of said loading unit,

means responsive to the movement of said wheeled-vehicle a predetermined distance for altering the supply of air under pressure to said first air cylinder for causing the rod thereof and said at least one charger finger connected thereto to be lowered, and

means responsive to the lowering of said at least one charger finger for altering the supply of air under pressure to said second air cylinder for moving said wheeled vehicle on said tracks in the direction away from said loading unit.

9. The combination of claim 8 wherein said means responsive to movement of the separating device, said means responsive to movement of said at least one charger finger, and said means responsive to movement of said wheeled vehicle are air valves.

10. The combination of claim 1 wherein said loading unit comprises

a pivotally mounted frame movable from a substantially horizontal position for receiving at least one of said preselected number of said bag groups to a substantially vertical position for loading the same into said bundling press,

means for moving said frame between said positions, retaining means on the receiving side of said frame for retaining said at least one of said preselected number of said bag groups in said frame, said retaining means being movable between an active and an inactive position,

bag group backup means movably disposed along a line coincidental with said predetermined path relative to the horizontally disposed position of said frame, and means responsive to the movement of said backup means a predetermined distance in the direction of advancement of said bag groups for operating said frame moving means.

11. The combination of claim 10 wherein said bag group backup means comprises a set of tracks extending from the terminal end of said predetermined path of said advancing means,

a trolley reciprocally movable on said tracks, an air cylinder supported by said trolley below said tracks having a rod associated therewith and being reciprocable therein along a path perpendicular to said tracks, and

at least on fingerlike retaining piece secured to said rod and movable therewith.

12. The combination of claim 11 wherein said tracks are inclined slightly upward from the bag group-receiving end of the loading unit to the opposite end thereof.

13. In combination with a bag-forming machine,

means for accumulating and continuously advancing bags comprising a pair of spaced, phased, cooperating helices each having a plurality of turns with a pitch equal to or greater than the thickness of a predetermined number of bags defining a bag group, means for continuously rotating the helices in unison for intercepting bag groups in periodic fashion and for successively rotating at least one group of bags at a time to change the attitude thereof;

a receiving conveyor positioned adjacent said helices for receiving said bag groups as they are discharged therefrom;

advancing means movable in a vertical path for being placed in an active position above the level of said receiving conveyor and behind the bag groups being positioned thereon and in an inactive position below the level of said receiving conveyor, said advancing means also being movable in a substantially horizontal direction for pushing the bag groups from said receiving conveyor;

a main advancing conveyor for receiving bag groups from said receiving conveyor;

means for successively operating said advancing means to advance a preselected number of said bag groups onto said main advancing conveyor;

at least one endless conveyor positioned along at least one side of said main advancing conveyor and carrying a plurality of separating lugs spaced apart a predetermined distance substantially equal to the thickness of said preselected number of said bag groups, said lugs being movable in at least part of their conveyance in the path of travel of the advancing bags on said main advancing conveyor;

charging means movable in a vertical path between a first position below the level of the main advancing conveyor and a second position above the level thereof and in the path of travel of the advancing bag groups, and movable also in a substantially horizontal path between a first position adjacent a predetermined point along the main advancing conveyor and a second position spaced beyond the main advancing conveyor in a line coincidental with the path of movement of the advancing bags;

a loading unit aligned with said main advancing conveyor and positioned adjacent said second position of said charging means, said loading unit being movable between a first bag group receiving position and a bag-bundling position;

bag group-retaining means pivotally secured to said loading unit and movable between a first position out of the line of advancing bag groups to permit bags to be received therein and a second position in line therewith for retaining bags placed in said loading unit; and,

bag group backup means movable in a line parallel with said path of travel of said advancing bags on said main conveyor for being moved in one direction along said line by a group of bags being charged into said loading unit and responsive to movement in said one direction of a predetermined distance for moving said loading unit to said bundling position.

14. The combination of claim 13 further including means responsive to movement of any of said separating lugs past a predetermined point in their path of travel for moving said charging means to said second vertical position,

means responsive to the movement of said charging means to said second vertical position thereof for moving said charging means to said second horizontal position thereof,

means responsive to the movement of any of said separating lugs past a second predetermined point in the path of travel thereof for moving said retaining means to said first position thereof,

means responsive to the movement of said charging means to said second horizontal position thereof for moving said bag group-retaining means to said second position thereof,

means responsive to the movement of said retaining means to said second position for moving said charging means to said first vertical position thereof, and,

means responsive to the movement of said charging means to said first vertical position thereof for moving said charging means to said first horizontal position thereof.

15. The method comprising the steps of:

collecting bags in groups of a predetermined number, orienting successive bag groups with the ends of the bags being disposed in one direction, the end of the bags in the next group being disposed in the opposite direction, and so on, in alternating fashion,

accumulating a preselected number of such groups and advancing the same along a predetermined path, maintaining a separation between successive ones of said preselected number of said bag groups,

transferring said preselected numbers of bag groups onto a loading unit of a bundling press at the terminal end of said predetermined path, and,

operating said loading unit after a predetermined number of said preselected number of said groups are transferred thereinto.

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