



(19) **United States**

(12) **Patent Application Publication**
Schmucker

(10) **Pub. No.: US 2003/0205033 A1**

(43) **Pub. Date: Nov. 6, 2003**

(54) **BAG HANDLING APPARATUS**

(76) Inventor: **Wayne Schmucker**, West Unity, OH (US)

Correspondence Address:
PURDUE LAW OFFICES
2735 N. HOLLAND-SYLVANIA ROAD
SUITE B-2
TOLDEO, OH 43615

(21) Appl. No.: **09/817,584**

(22) Filed: **Mar. 26, 2001**

Related U.S. Application Data

(60) Provisional application No. 60/214,241, filed on Jun. 26, 2000.

Publication Classification

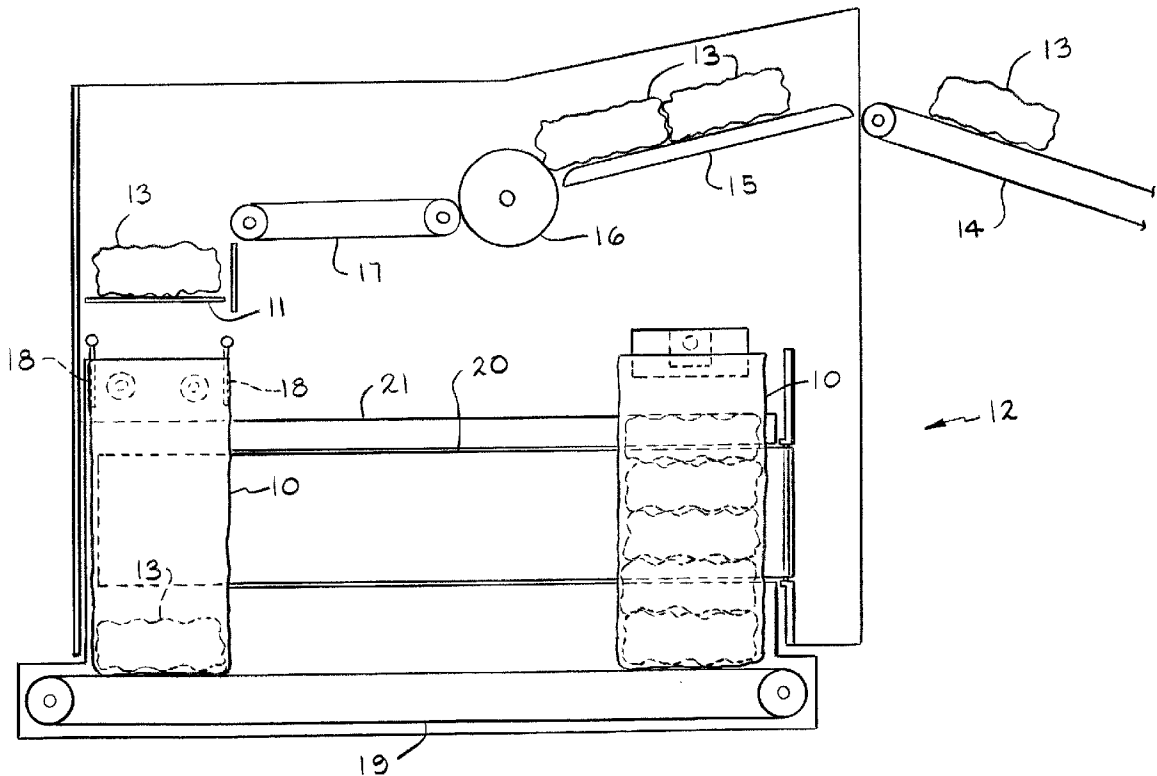
(51) **Int. Cl.⁷ B65B 43/44; B65B 57/10**

(52) **U.S. Cl. 53/493; 53/571**

(57) **ABSTRACT**

Apparatus for loading packages into a bag is disclosed. The apparatus comprises at least one first suction cup operable, when vacuum is supplied thereto, to support one side of a bag which extends generally vertically downwardly from the first suction cup, a feeding station operable to store bags in

a generally horizontal position, a transfer arm, at least one transfer arm suction cup operable, when vacuum is supplied thereto, to support one side of a bag, and means for moving the transfer arm suction cup longitudinally of the transfer arm. The transfer arm is rotatable between a first position in which the transfer arm suction cup is aligned with a portion of a bag in the feeding station and a second position in which the transfer arm suction cup is generally aligned with the first suction cup. The transfer arm is operable to move the transfer arm suction cup into engagement with a bag in the feeding station, to pick up the bag when vacuum is supplied to the transfer arm suction cup, to rotate so that the bag extends generally vertically downwardly from the transfer arm suction cup to a position in which the transfer arm suction cup can be moved longitudinally of the arm between a first position in which the first suction cup and the transfer arm suction cup are in closely adjacent, opposed relationship, and a second position in which a bag supported by the first and transfer arm suction cups is in an open position. The apparatus is also operable to load packages into the bag, to rotate the bag into which packages have been dropped in a given direction so that its top moves away from the transfer arm, to move the rotated bag laterally to a transfer station, and to support the bag in its rotated position while it is moved to the transfer station. Finally, the apparatus is also operable, to rotate the bag, after it reaches the transfer station, in a direction opposite to the given direction and to cause the rotated bag to continue rotating toward a horizontal position, and means for sealing the bag.



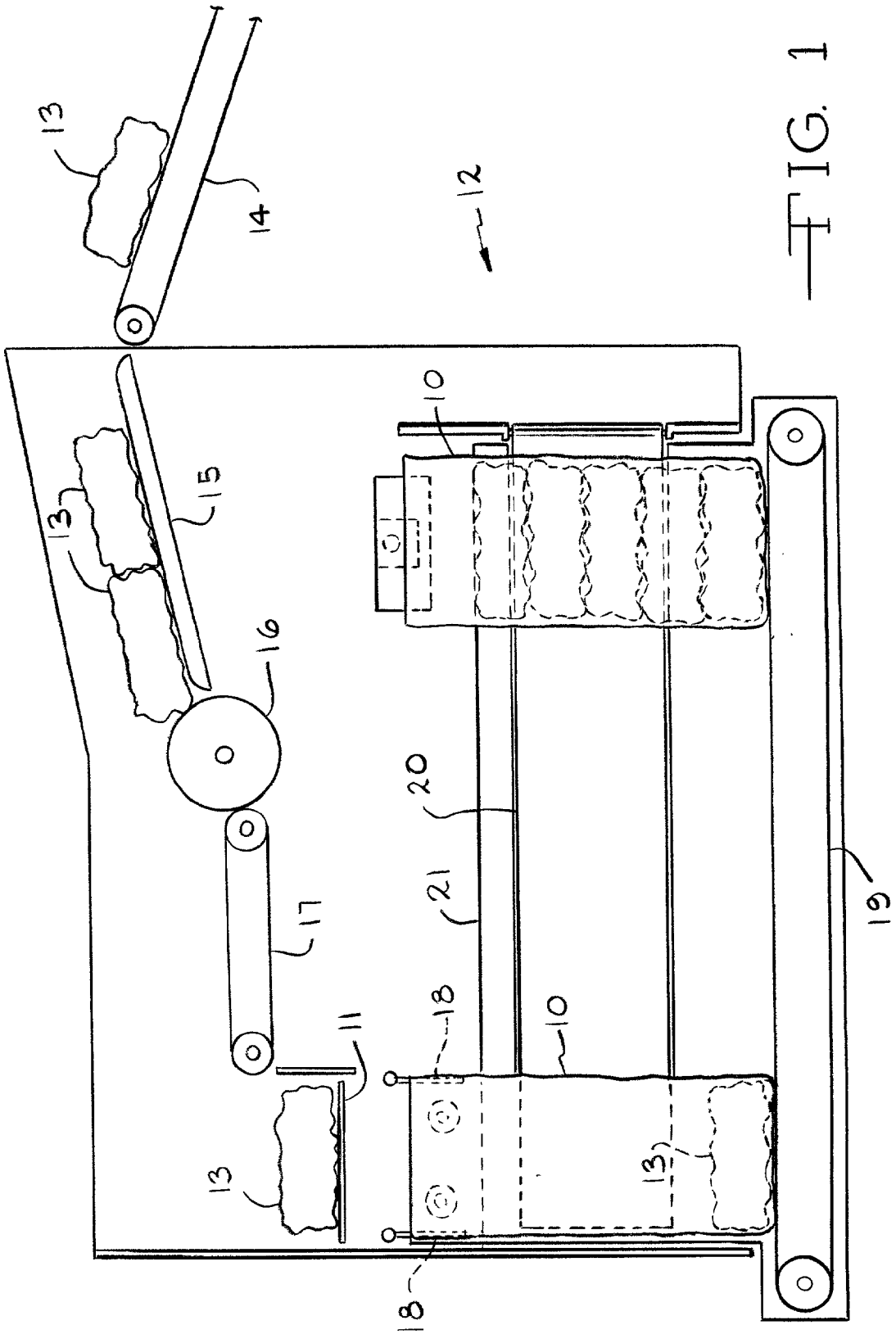


FIG. 1

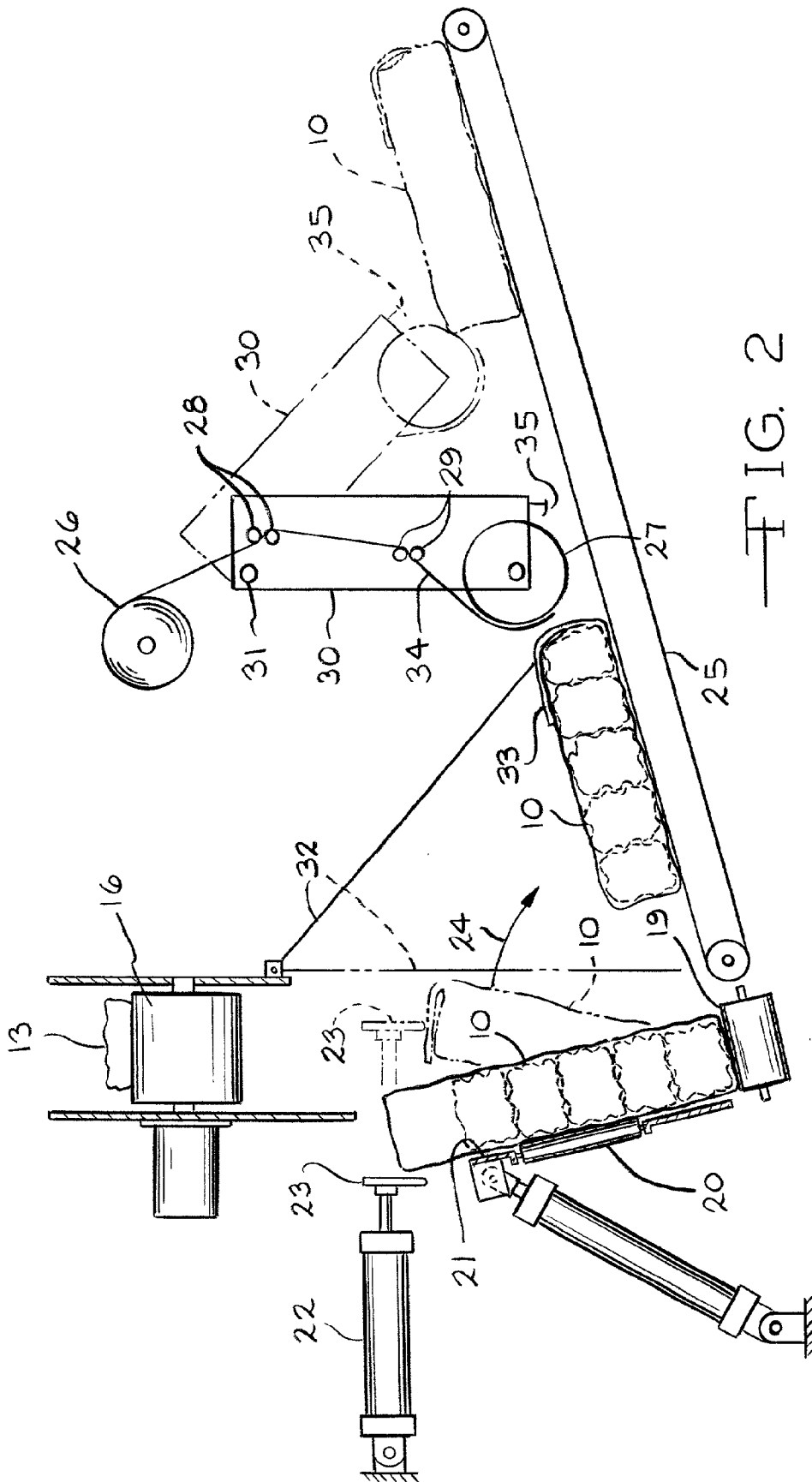
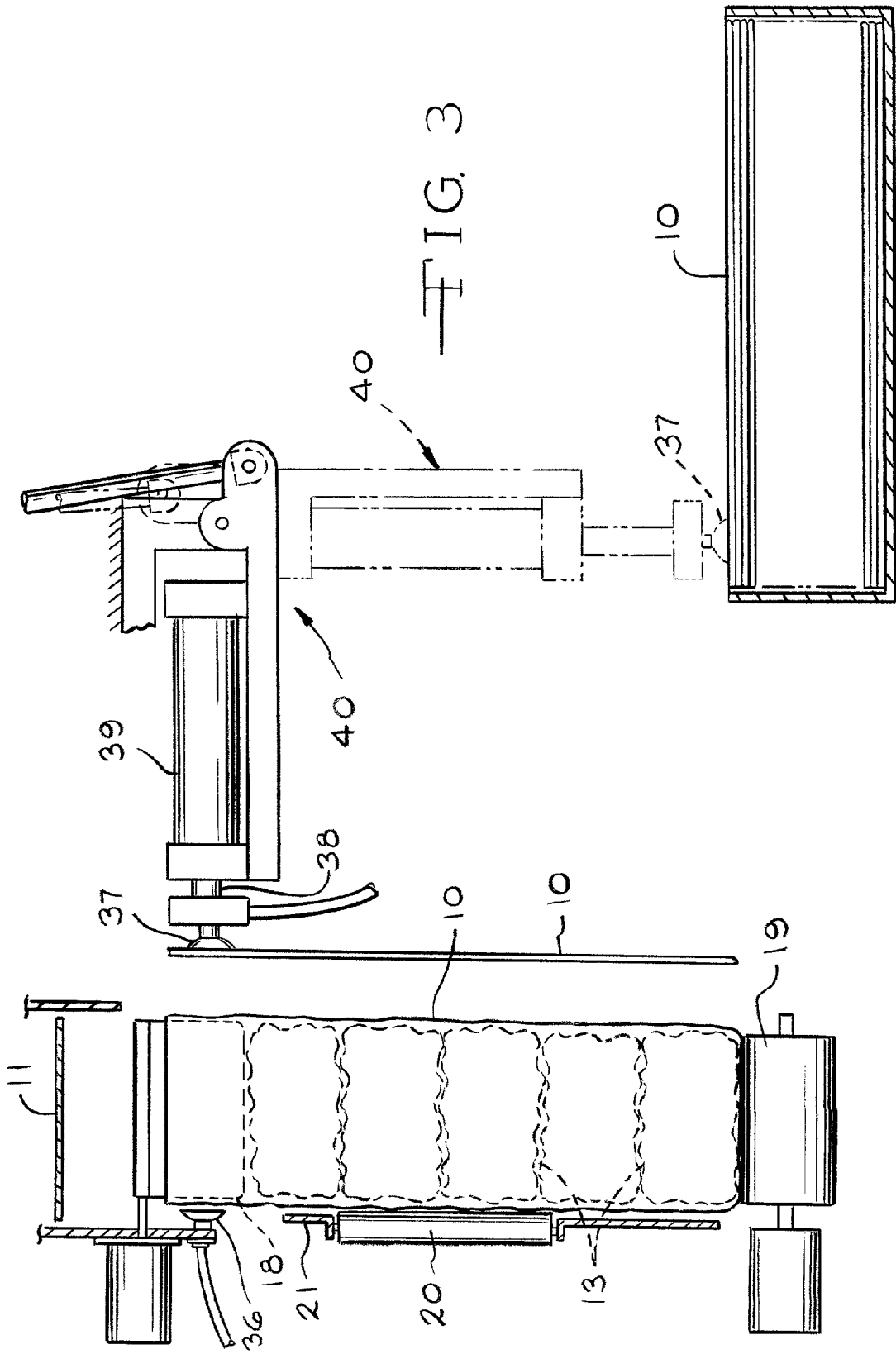
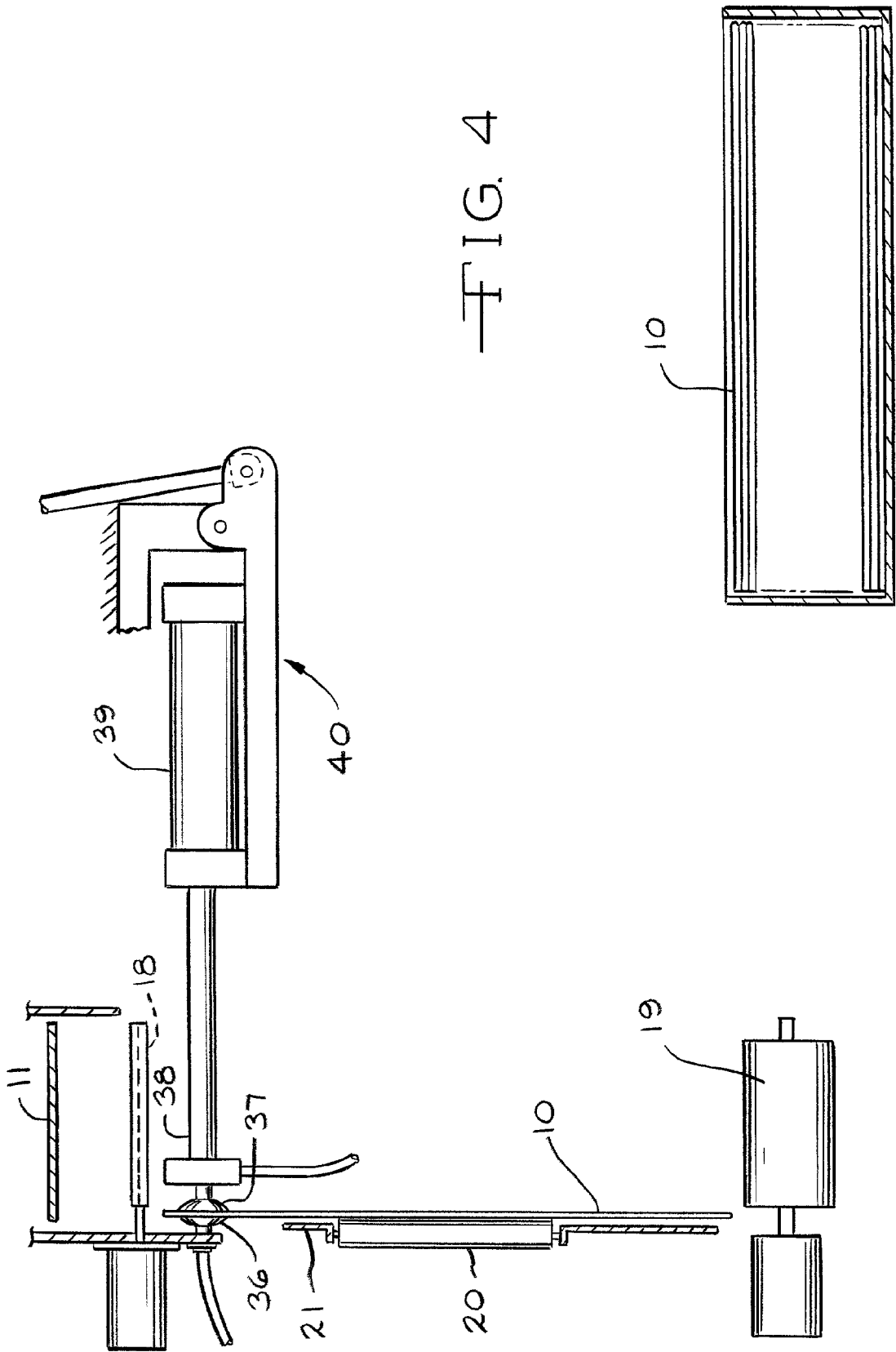


FIG. 2





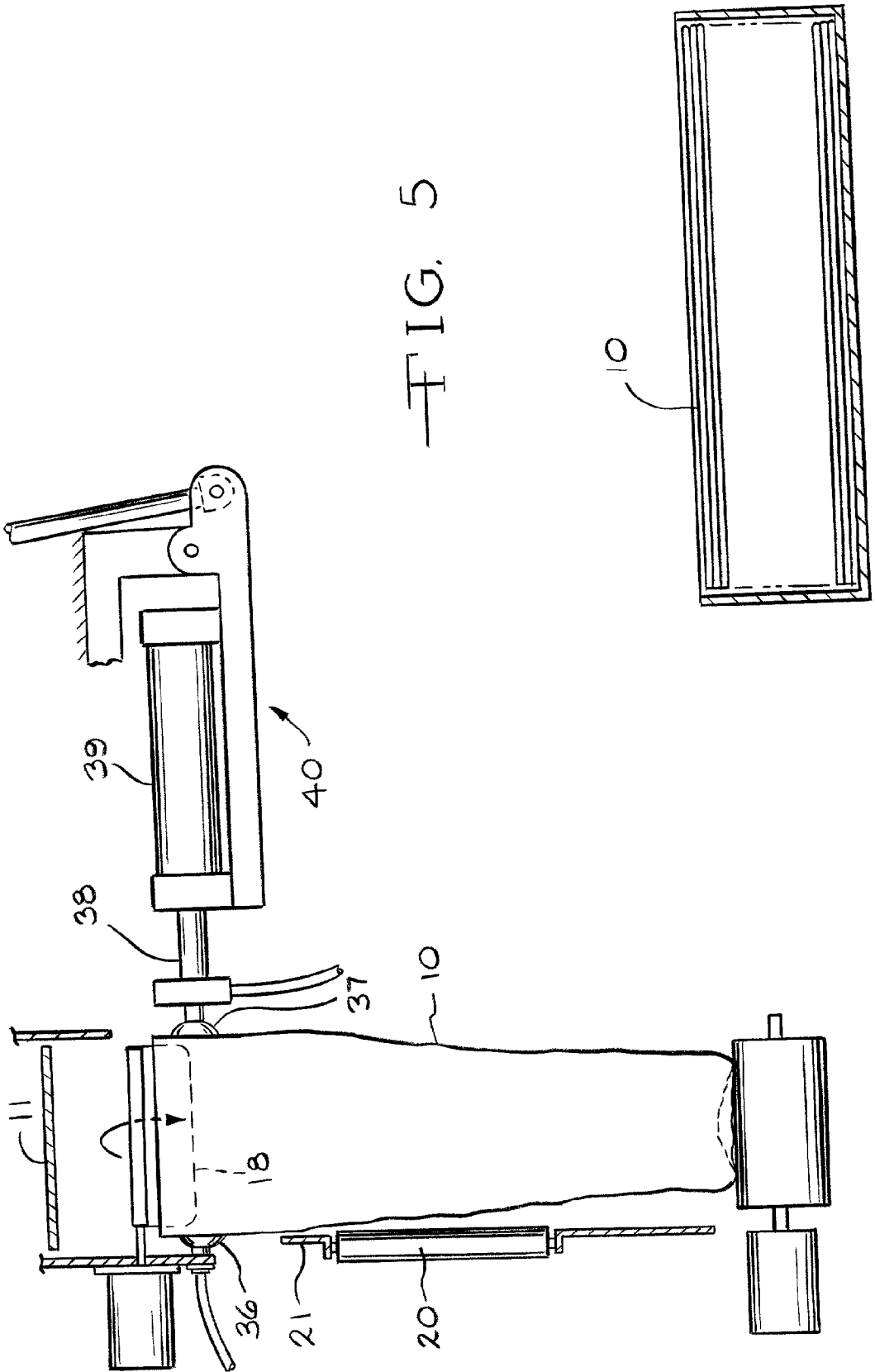
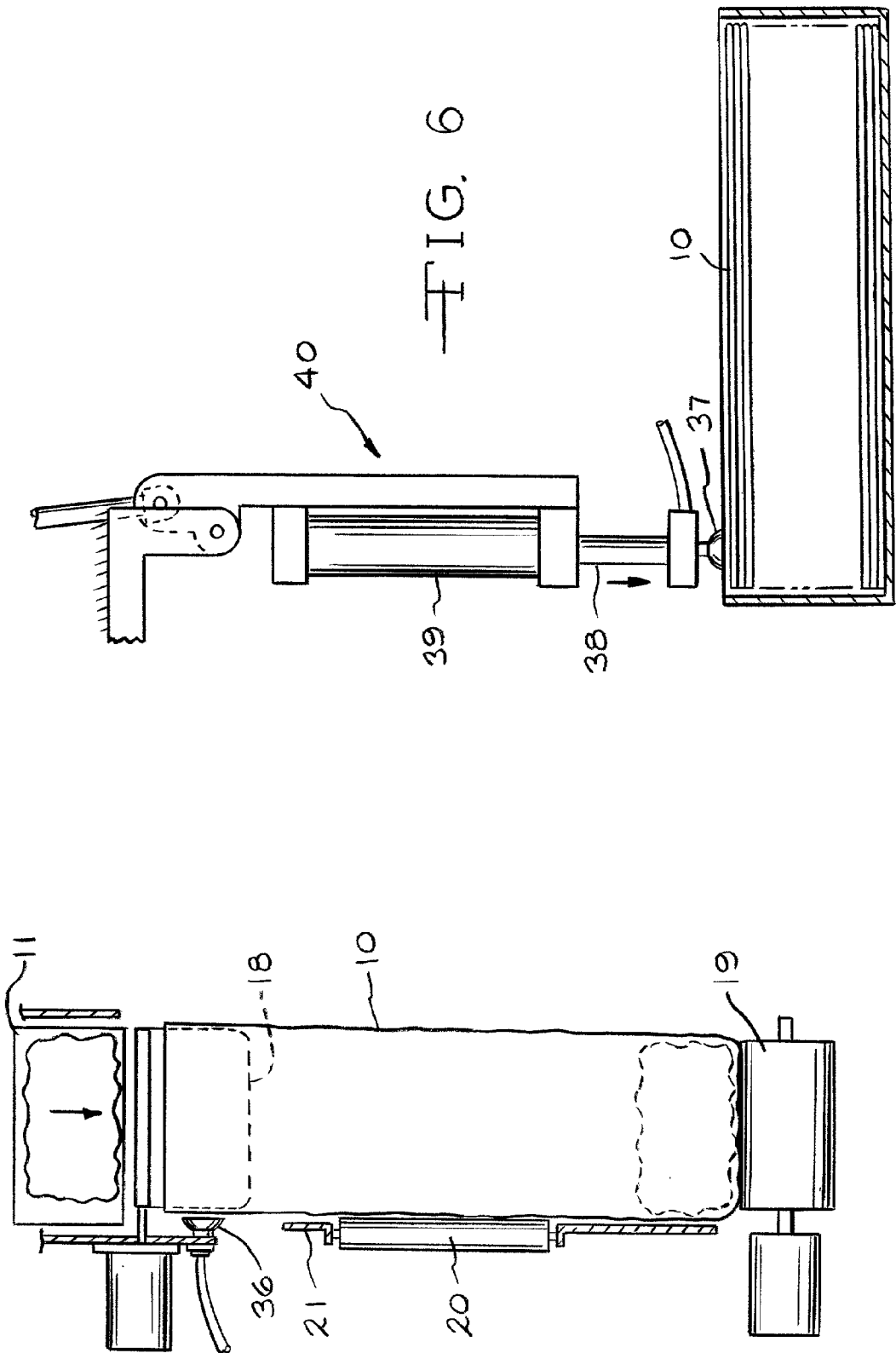


FIG. 5



BAG HANDLING APPARATUS

[0001] This invention relates to bag handling apparatus and, more particularly, to apparatus for loading packages, for example, packages of potatoes, into bags, and for closing the bags. The packages are fed onto an inlet conveyor, and sealed bags, each containing a predetermined number of the packages, are removed from an outlet conveyor.

THE PRIOR ART

[0002] Apparatus for loading packages, for example of potatoes, into bags, frequently called "bale bags", is known, being shown, for example, in the patents discussed below:

[0003] The first paragraph of the abstract of U.S. Pat. No. 4,045,940, granted Sep. 6, 1977 to Thomas J. White et al., reads as follows:

[0004] "In the overall system, vertically disposed, primary bags are filled with articles to a predetermined weight and conveyor means conduct the filled primary bags to a discharge point where a predetermined number of said filled bags are discharged at a discharge point and fall into an upright master bag, after which the filled master bag is carried away and closed, and an empty bag is positioned to receive primary bags of said predetermined number from said conveyor means."

[0005] The abstract of U.S. Pat. No. 5,117,614, granted Jun. 2, 1992 to Hugo Andersen, reads as follows:

[0006] "The invention provides a baling machine for baling groups of packages containing product into a bale bag. Packages are transported to fall down a chute individually where they are stacked in a group until the group is allowed to fall into a bale bag and into engagement with a moving platform which decelerates the group to minimize impact and resulting bruising. The filled bale bag is then ejected and closed."

[0007] The abstract of U.S. Pat. No. 5,201,166, granted Apr. 13, 1993 to Hugo Andersen, reads as follows:

[0008] "Bag handling apparatus for sequentially selecting bags from a supply thereof and positioning them for subsequent opening and filling has a vertically-movable slider positioned above a stack of horizontal closed bags. A carriage is pivotally secured to the slider and by links to a fixed point. Upward movement of the slider causes the carriage to be moved angularly from a downwardly directed position adjacent the stack of bags enabling the carriage to pick up a horizontal top bag to a forwardly directed position to cause the carriage to present the bag in a vertically-oriented position for subsequent opening and filling."

[0009] The patent states that four sets of openers are provided and positioned so that a bag to be filled can be opened to a rectangular configuration and states (see eighth paragraph from the end of the specification)

[0010] "Each opener **102** is pivotally mounted at **106** on a frame member **108** and is movable by operation of a hydraulic cylinder, the piston rod **10** of which is shown

between a retracted position shown in dotted outline and an opening position shown in full lines."

SUMMARY OF THE INSTANT INVENTION

[0011] The instant invention is apparatus for loading packages into a bag. The apparatus comprises at least one first suction cup operable, when vacuum is supplied thereto, to support one side of a bag which extends generally vertically downwardly from the first suction cup, a feeding station operable to store bags in a generally horizontal position, a transfer arm, at least one transfer arm suction cup operable, when vacuum is supplied thereto, to support one side of a bag, and means for moving the transfer arm suction cup longitudinally of said transfer arm. The transfer arm is rotatable between a first position in which the transfer arm suction cup is aligned with a portion of a bag in the feeding station and a second position in which the transfer arm suction cup is generally aligned with the first suction cup. The transfer arm is operable to move the transfer arm suction cup into engagement with a bag in the feeding station, to pick up the bag when vacuum is supplied to the transfer arm suction cup, to rotate so that the bag extends generally vertically downwardly from the transfer arm suction cup to a position in which the transfer arm suction cup can be moved longitudinally of the arm between a first position in which the first suction cup and the transfer arm suction cup are in closely adjacent, opposed relationship, and a second position in which a bag supported by the first and transfer arm suction cups is in an open position.

[0012] The apparatus also includes spreaders which are movable between a first, withdrawn position in which they do not interfere with movement of a bag supported by the first and transfer arm suction cups and a second in which they are inside a bag supported by the first and transfer arm suction cups, and are operable to support a bag in the open position, but do not interfere with the loading of a package into the bag. The apparatus also includes means for dropping packages into a bag supported in the open position by the spreaders.

[0013] The apparatus, in addition, includes means for moving a bag into which packages have been dropped laterally to a transfer station, and the last-named means is operable to rotate the bag in a given direction so that its top moves away from the transfer arm, and to support the bag in its rotated position while it is moved to the transfer station. Preferably, the means for moving a bag into which packages have been dropped laterally to a transfer station, is also operable, after the bag reaches the transfer station, to rotate the bag in a direction opposite to the given direction and to cause the rotated bag to continue rotating toward a horizontal position. In preferred embodiment, the apparatus additionally includes means for moving a portion of the bag above the topmost package therein in the given direction.

[0014] The apparatus additionally includes means operable to receive a bag in the transfer station which is rotating toward a horizontal position, and to move that bag away from the transfer station, and means for applying a sealing tape to a bag being moved away from the transfer station.

[0015] Finally, the apparatus includes means for preventing the delivery of a package to the means for dropping packages into a bag supported in the open position by the spreaders until after the elapse of sufficient time for the

previous package to drop into the bag supported by the spreaders and, after each bag is filled, until after the elapse of sufficient additional time for the filled bag to be released by and moved away from the spreaders, and for a successor bag to be positioned and supported in the open position by the spreaders.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 is a partially schematic view in vertical elevation showing an inlet conveyor, a bag loading station and a transfer station, means for placing packages delivered by the inlet conveyor in bags, and means for conveying bags containing the packages to the transfer station.

[0017] FIG. 2 is a partially schematic vertical sectional view showing the transfer station of FIG. 1 and a conveyor which receives bags from the transfer station and conveys them through a sealing station.

[0018] FIG. 3 is a partially schematic view in vertical section showing certain details of the bag loading station of FIG. 1.

[0019] FIG. 4 is a partially schematic vertical sectional view showing further details of the bag loading station of FIG. 1.

[0020] FIG. 5 is a partially schematic view in vertical section showing additional details of the bag loading station of FIG. 1.

[0021] FIG. 6 is a partially schematic vertical sectional view showing still more details of the bag loading station of FIG. 1.

OBJECTS OF THE INVENTION

[0022] It is an object of the instant invention to provide bag handling apparatus.

[0023] It is a further object to provide such apparatus for loading packages, for example, packages of potatoes, into bags, and for closing the bags.

[0024] Other objects and advantages will be apparent to those skilled in the art from the following detailed description of a preferred embodiment thereof, wherein reference is made to the foregoing drawings.

DETAILED DESCRIPTION OF THE INVENTION

[0025] Referring, now, in detail to the drawings, and, in particular to FIG. 1, two bags 10 are shown, one on the left which is in a filling position, being under a drop gate 11, and one on the right which has been filled, in apparatus according to the invention which is indicated generally at 12. Packages 13, for example, ten pound bags of potatoes, are delivered from a loading station (not illustrated) by a conveyor 14 and a slide 15 into contact with a timing roll 16, which rotates to convey packages 13, one after another, onto a conveyor 17, by which they are delivered to the drop gate 11. The conveyor 17 moves fast enough that the inertia of a bag 13 which is discharged therefrom causes it to continue to move to the left in FIG. 1, without longitudinal rotation, and to drop, while in the same longitudinal rotational position, onto the drop gate 11, which is pulled open periodically so that the package 13 thereon rolls down-

wardly, and into the one of the bags 10 which is being filled. The drop gate 11 opens, after a suitable time delay, in response to a signal from an electric eye indicating that a package 13 is near the end of the conveyor 17. The roll 16 operates continually while five packages are delivered to the drop gate 11, and then stops for a period of time, which can be as short as a second, long enough to enable one of the bags 10 that has been filled, while in the filling station, to be moved away from the filling station toward the position shown on the right, and for another bag to be positioned in the filling station. The speed of the conveyor 17 is sufficiently fast, relative to the speed at which packages 13 move down the slide 15, to provide sufficient time for a given package to drop into the bag supported by the spreaders and for the drop gate to close before the next package reaches the point where it causes the signal from the electric eye which initiates the next opening of the gate 11. The parts of the operation which involve moving a filled bag away from the filling station toward the position shown on the right in FIG. 1 and positioning another bag in the filling station are described in detail in the following paragraph.

[0026] When a given number of the packages 13 have been rolled into the bag 10, spreaders 18 are withdrawn by rotation from the interior of the bag 10; the rear of a conveyor 19, the bottom of a conveyor 20 and the rear of a back support 21 are rotated downwardly, as subsequently explained in more detail, so that the bag 10 which is in the filling position rotates downwardly and behind the plane of FIG. 1. The bag 10 is supported in this position by the conveyor 19, by the conveyor 20 and by the back support 21. Thereupon, the conveyors 19 and 20 are energized simultaneously and driven at the same speed to move the bag 10 away from the filling position, to the right in FIG. 1, and are stopped simultaneously when the bag 10 is in a transfer station, i.e., is in the position (left to right) shown in FIG. 1 for the filled bag, in which position it is aligned with a cylinder 22. In the meantime, the previously filled bag has been moved from the transfer station, as described below with reference to FIG. 2.

[0027] The cylinder 22 is activated periodically, whenever a filled bag is in the transfer station, so that a head 23 thereof moves the left side of the portion of the bag 10 in the transfer station which is above the packages 13 therein to the right. Meanwhile, the conveyor 19, the conveyor 20 and the back support 21 are rotated back to their respective horizontal and vertical positions, so that the bag 10 is rotated upwardly and to the right. The movement of the bag is sufficiently fast that its momentum causes the filled bag, as indicated by an arrow 24, to rotate onto an exit conveyor 25, by which it is moved upwardly and to the right to and beyond a sealing station. A bag is shown in broken lines in FIG. 2 as it is rotating toward the exit conveyor 25.

[0028] The sealing station comprises a tape dispenser 26 from which sealing tape is delivered to an applicator roll 27, passing between cooperating rolls 28-28 and 29-29. The applicator roll 27 and the cooperating rolls 28-28 and 29-29 are all pinned to a plate 30 which is supported by a pin 31 so that it can swing, as subsequently described in more detail, between the position shown in solid lines in FIG. 2 and that shown in broken lines.

[0029] A flexible curtain 32 is suspended so that the top of a bag 10 rotating onto the exit conveyor 25 as described

above contacts the curtain 32, and the right side of the portion of the bag above the packages 13 therein is moved to the left on top of the portion of the bag which was previously folded to the right by the head 23 of the cylinder 22, and on top of the bag 10, as indicated at 33.

[0030] In the position shown in solid lines in FIG. 2, a bag 10 filled with packages 13 has been moved by the conveyor 25 to a position where it is entering the sealing station. In this position for the bag 10, the flexible sheet 32 is still in contact with the portion 33 of the bag which was originally above the packages 13 therein, holding it in contact with the filled portion of the bag, and the open end of the bag is approaching contact with the roll 27 and with sealing tape, designated 34, which extends from the dispenser 26 between the rolls 28 and 29 and over the applicator roll 27, where, as previously stated, the bag 10 contacts it. One side of the tape 34 carries a pressure sensitive adhesive; that side faces the bag 10, so that the sealing operation starts as soon as the bag makes contact with the tape 34. As the bag 10 continues to advance, its movement causes the head plate 30 to rotate counterclockwise around the pin 31, and the surface of the bag 10 moves relative to the roll 27, from which tape is dispensed. The movement of the bag 10 relative to the roll 27 continues, with the latter pressing the tape 34 into contact with the former, until the closed end of the bag 10 advances far enough to clear the roll 27; thereupon, the head plate 30 rotates clockwise back to the position shown in solid lines. During this clockwise rotation, a blade 35 cuts the tape 34. After the clockwise rotation of the head to the position shown in solid lines in FIG. 2, the apparatus is positioned to perform the sealing operation just described on the next bag 10, and a bag 10 shown in broken lines can be removed manually from the apparatus and prepared for shipment, for example, by stacking on a pallet (not illustrated).

[0031] Referring to FIG. 3, a bag 10 filled with packages 13 is shown under the drop gate 11, with the spreaders 18 inside the top of the bag. Suction cups 36 do not engage the filled bag 10 at this point in the operation. An empty bag 10 is supported, just to the right of the filled bag 10, by suction cups 37 on the rod 38 of a cylinder 39 which is carried by a bag feeding arm indicated generally at 40. The next sequence of the part of the apparatus 12 shown in FIG. 3 involves rotating the spreaders 18 so that they are withdrawn from the interior of the bag 10, rotating the conveyors 19 and 20 and the back support 21, and energizing the conveyors 19 and 20. Rotating the conveyors 19 and 20 and the back support 21 causes the top of the bag 10 which is filled with packages 13 to move to the left until the suction cup 36 is to the right of the right side of the filled bag 10, while the energized conveyors 19 and 20 move the filled bag to the position where it is aligned with the cylinder 22 (see FIG. 2; the cylinder 22 is not shown in FIG. 3) for transfer to the conveyor 25 as described above. Referring, again, to FIG. 3, after the filled bag 10 has been conveyed away from the position shown, the cylinder 39 advances the rod 38 and the suction cups 37 so that the bag 10 engaged by the suction cups 37 is moved into contact with the suction cups 36, to which vacuum is then supplied. The rod 38 and the suction cups 37 are then moved to the right in FIG. 4 to open the bag 10; and the spreaders 18 are rotated into the interior of the open bag 10. FIG. 5 shows the apparatus at this stage of the cycle. Vacuum is then released from the suction cups 36 and 37; the rod 38 and the suction cups 37 are withdrawn; the arm 40 is rotated 90° counterclockwise; and the rod 38 and

the suction cups 37 are advanced into contact with the topmost one of a plurality of bags 10 in a delivery station. FIG. 6 shows the apparatus at this stage of the cycle, and FIG. 3 shows, in broken lines, the arm 40, the cylinder 39, the rod 38 and the suction cups 37 in the FIG. 6 position. Vacuum is then supplied to the suction cups 37, the rod 38 is withdrawn slightly, and the arm 40 is rotated clockwise so that the apparatus is again positioned as shown in FIG. 3.

[0032] It will be appreciated that various changes to and modifications of the apparatus described above can be made without departing from the spirit and scope of the invention, as defined in the following claims, and that, in its essential details, the invention is apparatus for loading packages into a bag. The apparatus comprises at least one first suction cup operable, when vacuum is supplied thereto, to support one side of a bag which extends generally vertically downwardly from the first suction cup, a feeding station operable to store bags in a generally horizontal position, a transfer arm, at least one transfer arm suction cup operable, when vacuum is supplied thereto, to support one side of a bag, and means for moving the transfer arm suction cup longitudinally of said transfer arm. The transfer arm is rotatable between a first position in which the transfer arm suction cup is aligned with a portion of a bag in the feeding station and a second position in which the transfer arm suction cup is generally aligned with the first suction cup. The transfer arm is operable to move the transfer arm suction cup into engagement with a bag in the feeding station, to pick up the bag when vacuum is supplied to the transfer arm suction cup, to rotate so that the bag extends generally vertically downwardly from the transfer arm suction cup to a position in which the transfer arm suction cup can be moved longitudinally of the arm between a first position in which the first suction cup and the transfer arm suction cup are in closely adjacent, opposed relationship, and a second position in which a bag supported by the first and transfer arm suction cups is in an open position.

[0033] The apparatus also includes spreaders which are movable between a first, withdrawn position in which they do not interfere with movement of a bag supported by the first and transfer arm suction cups and a second in which they are inside a bag supported by the first and transfer arm suction cups, and are operable to support a bag in the open position, but do not interfere with the loading of a package into the bag. The apparatus also includes means for dropping packages into a bag supported in the open position by the spreaders.

[0034] The apparatus, in addition, includes means for moving a bag into which packages have been dropped laterally to a transfer station, and the last-named means is operable to rotate the bag in a given direction so that its top moves away from the transfer arm, and to support the bag in its rotated position while it is moved to the transfer station. Preferably, the means for moving a bag into which packages have been dropped laterally to a transfer station, is also operable, after the bag reaches the transfer station, to rotate the bag in a direction opposite to the given direction and to cause the rotated bag to continue rotating toward a horizontal position. In preferred embodiment, the apparatus additionally includes means for moving a portion of the bag above the topmost package therein in the given direction.

[0035] The apparatus additionally includes means operable to receive a bag in the transfer station which is rotating

toward a horizontal position, and to move that bag away from the transfer station, and means for applying a sealing tape to a bag being moved away from the transfer station.

[0036] Finally, the apparatus includes means for preventing the delivery of a package to the means for dropping packages into a bag supported in the open position by the spreaders until after the elapse of sufficient time for the previous package to drop into the bag supported by the spreaders and, after each bag is filled, until after the elapse of sufficient additional time for the filled bag to be released by and moved away from the spreaders, and for a successor bag to be positioned and supported in the open position by the spreaders.

[0037] It will be appreciated that various other changes and modifications of the apparatus described above can be made without departing from the spirit and scope of the invention as defined in the following claims.

I claim:

1. Apparatus for loading packages into a bag, said apparatus comprising at least one first suction cup operable, when vacuum is supplied thereto, to support one side of a bag which extends generally vertically downwardly from said first suction cup, a feeding station operable to store bags in a generally horizontal position, a transfer arm, at least one transfer arm suction cup operable, when vacuum is supplied thereto, to support one side of a bag, means for moving said transfer arm suction cup longitudinally of said transfer arm, said transfer arm being rotatable between a first position in which said transfer arm suction cup is aligned with a portion of a bag in said feeding station and a second position in which said transfer arm suction cup is generally aligned with said first suction cup, said transfer arm being operable to move said transfer arm suction cup into engagement with a bag in said feeding station, to pick up the bag when vacuum is supplied to said transfer arm suction cup, to rotate so that the bag extends generally vertically downwardly from said transfer arm suction cup to a position in which said transfer arm suction cup can be moved longitudinally of said arm between a first position in which said first suction cup and said transfer arm suction cup are in closely adjacent, opposed relationship, and a second position in which a bag supported by said first and said transfer arm suction cups is in an open position.

2. Apparatus as claimed in claim 1 which additionally includes spreaders which are movable between a first, withdrawn position in which they do not interfere with movement of a bag supported by said first and transfer arm suction cups and a second in which they are inside a bag supported by said first and transfer arm suction cups, and are operable to support a bag in the open position, but do not interfere with the loading of a package into the bag.

3. Apparatus as claimed in claim 2 which additionally includes means for dropping packages into a bag supported in the open position by said spreaders.

4. Apparatus as claimed in claim 3 which additionally includes means for moving a bag into which packages have been dropped laterally to a transfer station, said last-named means being operable to rotate the bag in a given direction so that its top moves away from said transfer arm, and to support the bag in its rotated position while it is moved to said transfer station.

5. Apparatus as claimed in claim 4 wherein said means for moving a bag into which packages have been dropped laterally to a transfer station, is also operable, after the bag reaches the transfer station, to rotate the bag in a direction opposite to the given direction and to cause the rotated bag to continue rotating toward a horizontal position.

6. Apparatus as claimed in claim 5 which additionally includes means for moving a portion of the bag above the topmost package therein in the given direction.

7. Apparatus as claimed in claim 5 which additionally includes means operable to receive a bag in the transfer station which is rotating toward a horizontal position, and to move that bag away from the transfer station.

8. Apparatus as claimed in claim 7 which additionally includes means for applying a sealing tape to a bag being moved away from the transfer station.

9. Apparatus as claimed in claim 4 which additionally includes means operable to deliver packages to said means for dropping packages into a bag and to time the rate at which successive bags are so delivered so that there is time for each bag to be dropped into the bag before is delivered to said bag dropping means.

* * * * *