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(54) Improvements relating to carton erecting apparatus.

(57) A carton erecting apparatus comprising a carton feed magazine (12) having a horizontal driven conveyor (15) and a downwardly inclined ramp (18) extending therefrom, a transfer mechanism (24) arranged to move cartons (17) from the feed magazine (12) one at a time to a holding station (38) on a rotatable carriage (36), the cartons being partially erected while being moved to the holding station (38) by means of engagement with an inclined pressure member (30), the rotatable carriage having a plurality of spaced holding stations (38) with gripping means (41) associated with each said holding station, the gripping means (41) being operable in response to rotation of the carriage (36) to open to permit entry into or exit from the associated holding station (38) of a carton (17) and to close to retain a carton (17) in the holding station (38).

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FIG.1.

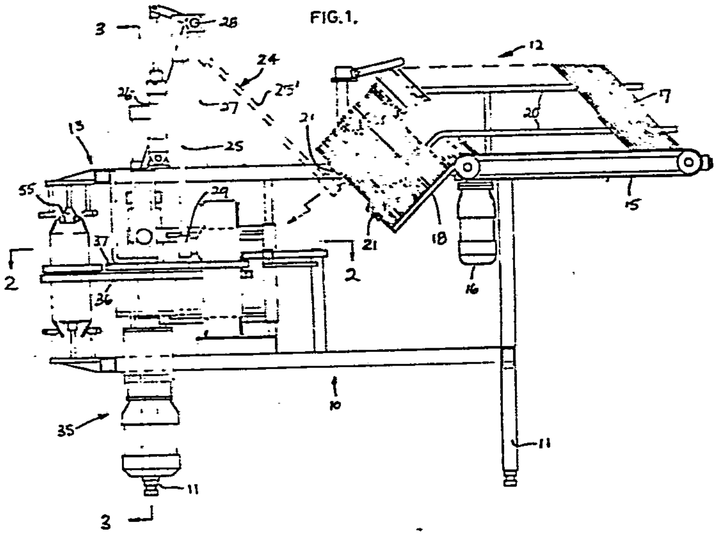

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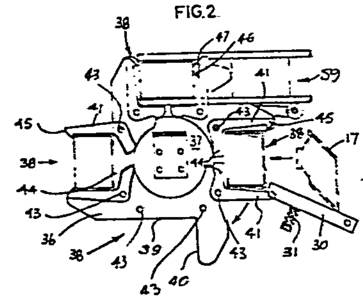
FIG.2.



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"IMPROVEMENTS RELATING TO CARTON ERECTING APPARATUS"

This invention relates to apparatus for erecting cartons from a f'ded flat condition to an open condition for receiving goods to be packaged.

The invention specifically relates to the erecting of cartons of the type having a plurality of sidewalls each wall hingedly attached to each adjoining wall for angular movement about respective parallel axes, and transportable in a folded condition with adjoining sides co-extensive or juxtapositioned. Usually cartons of the above type have four sidewalls which form a rectangular shaped carton, however, it is to be understood that the invention is applicable to cartons of other shapes.

In order to reduce transportation costs it is customary for a carton manufacturer to produce a carton of the above type in a form so that it may be folded flat for transport and storage purposes, and machines are available for opening the folded carton into an erected state to receive the goods to be packaged.

In the following description particular reference will be made to cartons for receiving sealed flexible bags containing liquid, such as wine or fruit juice. It is, however, to be understood that the invention is not limited to application to cartons for these specific uses.

One of the present known and used systems for erecting cartons is to stack the folded cartons vertically in a magazine, and to feed the load of cartons forward to a surface, where they are drawn off one by one into a "multi-chain" erection mechanism. The "multi-chain" mechanism has a plurality of fingers attached to chains mounted and driven to operate in sequence to move the carton intermittently in a straight horizontal path. The chains are driven by a motor with a stop-start action and draw each carton through various stations where functions of flap preparation, loading and closing are performed.

The disadvantages of such a system are:-

(1) The chains and components mounted thereon are

very expensive to build.

(2) The chain on the return flight is not utilized.

(3) The drive has to be very large because of the drag of the chains.

(4) The carton magazines (usually chains) are unreliable when feeding heavier cartons.

Currently used cartons usually incorporate an overlapped joint and thus when loaded on to the magazine in a flat-folded condition, this joint which gives the carton stack an uneven thickness. When this type of carton is stacked in long lengths, the stack becomes uneven and "fans-out" according to the disparity of thickness. Long magazines also suffer from a variation in pressure at the point where the foremost carton is extracted, and it is very difficult to regulate the feed rate from a full magazine to nearly empty magazine, and provide an even pressure on the leading folded carton.

Certain types of carton packaging do not lend themselves to the conventional "multi-chain" type machine. On example of this is the "bag in the box" type, such as used in wine and fruit juice and other liquids filled in plastic bags enclosed in a carton. The filling rate for these is inherently slow 10-20 per minute, and so, if a high production rate is to be obtained, a large number of filling machines are required, each with its own carton erector. Expensive carton erectors cannot be justified in such a plant. The ideal is to have a very simple inexpensive system close to the filling machine which can be operated by one person. The system should also have a large length of magazine to avoid frequent reloading.

It is therefore the object of the present invention to provide a carton erecting apparatus which is of simple and inexpensive construction, and effective in operation.

With this object in view there is provided a carton erecting apparatus comprising a carriage mounted for

stepwise movement about a vertical axis, a plurality of carton holding stations on carriage spaced (preferably equally) about said vertical axis, gripping means associated with each holding station and supported by the carriage, each said gripping means being operable in response to rotation of the carriage to open to permit entry into or exit from the associated holding station of a carton and to retain a carton in said holding station.

Preferably each holding station includes two abutment faces, stationary with respect to the carriage, and angularly related with respect to each other in the horizontal plane to abut two similarly angularly related walls of a carton received in the holding station. Conveniently each gripping means comprises an arm pivotally mounted on the carriage for movement about a vertical axis, and having an abutment face to engage a wall of the carton and hold the carton against the two stationary abutment faces. The arm maybe provided with a hook-like end to engage a corner of the carton when the abutment face of the arm engages the carton.

The pivotal movement of the arm is controlled in response to the rotation of the carriage such as by a cam stationary with respect to the carriage. The movement of the arm is such that in one position of the carriage the arm is outwardly inclined to permit entry of the carton into the holding station, and is subsequently moved to grip the carton with the abutment face of the arm engaging a wall of the carton; and is finally moved again to the outwardly inclined position to permit exit of the carton from the holding station.

The rotational movement of the carriage is effected in a series of steps so that each holding station is presented in sequence to mechanisms that perform operations to transform a flat folded blank to a multi-sided closed end carton.

There is also provided by this invention a feed magazine for folded carton blanks comprising a substan-

ially horizontal conveyor upon which a plurality of folded blanks may be supported with the lower edge thereof rested upon the conveyor and the blank extending upwardly therefrom, a downwardly inclined ram at one end of the conveyor to receive the blanks therefrom, the inclination of the ramp being such that the blanks will gravity feed to the lower end thereof with the lower edge of the blanks rested upon the ramp, and drive means to operate the conveyor to feed blanks to the upper end of the ramp.

Conveniently the drive means is controlled to automatically feed the blanks onto the ramp to maintain a substantially constant number of blanks on the ramp. In this way the pressure on the lowermost blank on the ramp is not subject to large variations that would affect the operation of the withdrawal of the blanks.

The invention will be more readily understood from the following description of one preferred practical arrangement of the erecting apparatus and the blank feed magazine, as illustrated in the accompanying drawings.

In the drawings:-

Figure 1 is a diagrammatic side view of the erecting apparatus and magazine.

Figure 2 is a diagrammatic sectional view along line 2-2 in Figure 1 of the erecting apparatus.

Figure 3 is a diagrammatic sectional view along line 3-3 in Figure 1 of the erecting apparatus.

Figure 4 is a fragmental view taken from Figure 2.

Referring now to Figure 1 the apparatus comprises a main frame 10 supported on legs 11 and carrying a blank carton feed magazine 12 and a carton erecting apparatus 13.

The feed magazine comprises an endless conveyor 15 driven by a motor 16 with the upper flight of the conveyor substantially horizontal so that the folded blank cartons 17 may be supported thereon with the lower ends of the blanks on the conveyor and the blank extending generally upwardly. The forward end of the conveyor 15

co-operates with the upper end of a ramp 18 to deliver the cartons 17 successively from the conveyor on to the ramp so that they will move by gravity therealong to a delivery position 22. A number of guide rails 20 are provided along either side of the ramp 18 and the conveyor 15 to maintain the blanks in position on the conveyor. At the lower end of the ramp, the guide rails 20 are bent inwardly to form tabs 21 which project slightly across the path of the blanks down the ramp so as to retain the blanks on the ramp until withdrawn by the transfer mechanism provided. The extent of projection of the tabs 21 across the path is such that the blanks 17 can be withdrawn without necessitating any movement of the tabs or the guide rails. The conveyor 15 is driven by the motor 16 which is controlled by a sensor activated by the blanks on the ramp 18.

In order to withdraw the blanks singularly from the feed magazine 12 there is provided a transfer mechanism 24 bracing a pivotal arm 25 mounted by a pivot shaft 28 on an upward extension 27 of the main frame 10. A power cylinder 26 is operable to move the arm 25 between the position shown in full outline to the position 25' shown in broken outline in Figure 1 and to return in timed sequence with the operating of the rest of the mechanism. The lower end of the arm 25 carries a releasable attachment means such as a large suction cup 29 or as an alternative a plurality of smaller suction cups.

As can be seen in Figure 2 the suction cup 29 engages the carton blank centrally of one side of the carton but offset with respect to the centre of the folded blank. As the arm 25 carrying the suction cup returns from the dotted position 25' to the full outline position in Figure 1, the carton is slightly bowed by the withdrawing force of the suction cup to release the opposite edges of the blank from the turned over taps 21 of the guide rails 20. As the carton moves from the magazine towards the erection apparatus 13, one edge of the carton moves

along a pressure member formed by an inclined guide bar 30, as seen in Figure 2, and the inclination of the guide bar to the direction of movement of the carton causes the blank to open from its flattened condition to take up a substantially rectangular shape as it reaches the erection apparatus. The guide bar 30 may be resiliently urged into the path of the carton by means of a spring element 31.

The erection apparatus comprises a motor and drive mechanism 35 supported on the frame 10 with an upwardly extending vertical output shaft to which is attached a substantially horizontal carriage plate 36. Suspended from the frame 10 and mounted co-axially above the carriage plate 36 is a stationary cam 37. The carriage plate 36 has equally spaced around its axis four carton holding stations 38 as can be best seen in Figure 2. The plate is shaped at each station to provide two right angularly related abutment surfaces or edges 39 and 40, as best seen in the lower portion of Figure 2 where certain components have been removed to more clearly show the abutment surfaces. Each holding station also incorporates a pair of generally L shaped gripping arms 41, each pivotally mounted to the carriage plate 36 about respective vertical axes 43 located adjacent the corner of the L configuration. The arms 41 have a cam follower portion 44 and a hooked end 45 forming angularly disposed carton engaging surfaces 46,47. The hooked ends of the arms 41 are arranged so as to grip the outer corners of a carton when it is received in the holding station with two adjacent walls in engagement with the abutment surfaces 39,40 on the carriage plate 36. When the cam follower portions 44 are on the high rise part of the cam 37 as depicted in the right hand holding station 38 in Figure 2, the hooked ends 45 of the arms 41 are widely spaced to permit the carton to enter therebetween into the holding station. When the cam follower portions 44 are on the lower portion of the cam 37 the hooked ends of the arms 45 are in engagement with the outer corners of the carton to firmly

hold against the abutment surfaces 39 and 40 and prevent dislodgement of the carton from the carriage plate. Conveniently, the arms 41 may be spring loaded to inherently take up this gripping position.

As the carton moves in sequence between the four successive positions of the carriage plate the flaps of the carton are subjected to co-operation with various fixed and movable members to fold the end flaps of the carton. In particular as the carton moves from the right hand station in Figure 2 to the lower station, two of the flaps on the lower end of the carton are folded to a horizontal position spanning the bottom of the carton and held in that position whilst a flexible bag containing appropriate material is fed into the upper end of the carton through the guide chute 50 as seen in Figure 3. Whilst in this position the two folded flaps at the lower end of the carton are held in position by the support 51 as it passes through the next position to the left of Figure 2 and towards the final position on the upper side of Figure 2. As the carton passes from the lower position to the left hand one in Figure 2, two of the top flaps of the carton are closed across the contents of the carton, and as the carton then passes from the left hand to the upper position in Figure 2, the final closure of the top and bottom of the carton is effected by guides such as at 52 in Figure 3. The final closing being effected by power cylinders 53 and 54 as seen on the right hand side of Figure 3. It is to be understood that before the final flaps are closed on the top and bottom of the carton, a glue coating is applied to the surfaces by suitable device such as a spray head as indicated at 55 in Figure 1.

Once a carton has reached the final position, that is the top position in Figure 2, it is located adjacent an inlet to a delivery conveyor or chute 59. The delivery conveyor may be comprised of a number of guide rails and the like for directing the cartons to a desired location or could, if desired, also include a driven conveyor

system. As shown in the detail of Figure 4 there is provided an arm 57 pivoted about an axis 58 whereby the free end of the arm 57 engages the carton 17 at the final holding station position. The arm 57 has a power cylinder 56 arranged to push the arm 57 and thereby the carton 17 from the holding station into the inlet of the conveyor 59 such that the carton clears the hooked ends 45 of the gripping arms 41 but not the remainder of the gripping arms. In this position rotation of the carriage 36 will result in the gripping arms 41 pushing the carton 17 along the delivery conveyor 59.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Carton erecting apparatus comprising a carriage (36) mounted for stepwise rotational movement about a vertical axis, a plurality of carton holding stations (38) on said carriage (36) spaced about said vertical axis, and carton gripping means (41) located at each said holding station (38) and supported by said carriage (36), characterized in that each said gripping means (41) is operable in response to rotation of the carriage (36) to open to permit entry into or exit from the associated holding station (38) of a carton (17), and to close to retain a carton (17) in said holding station (38).

2. Apparatus according to claim 1, characterized in that each said holding station (38) includes two abutment means (39,40), stationary with respect to the carriage (36), and angularly related with respect to each other to respectively abut two similarly angularly related walls of a carton (17) received at the holding station (38).

3. Apparatus according to claim 1 or claim 2, characterized in that each said gripping means (41) comprises an arm pivotally mounted on the carriage (36) and including a carton engaging zone adapted to engage at least one wall of a carton (17).

4. Apparatus according to claim 3, characterized in that the carton engaging zone of each said gripping means (41) comprises two angularly related regions (46,47), each being adapted to engage two similarly angularly related walls of a carton.

5. Apparatus according to claim 3 or claim 4, characterized in that an end (44) of each said gripping arm (41) opposed to the carton engaging zone relative to the pivotal connection (43) of the arm to the carriage (36) is adapted to engage a stationary cam (37) whereby

upon rotation of the carriage (36) the arms (41) are moved between a first carton engaging position and a second position permitting entry of a carton (17) to the associated holding station (38).

6. Apparatus according to anyone of claims 3 to 5, characterized in that two said gripping arms (41) are located at each said holding station (38).

7. Apparatus according to anyone of claims 1 to 6, characterized in that a feed magazine (12) is provided for a plurality of folded carton blanks (17) whereby the blanks are successively fed to a delivery position (22).

8. Apparatus according to claim 7, characterized in that transfer means (24) is provided to move a carton blank (17) from the delivery position (22) to one of said holding stations (38) on said carriage (36), said transfer means (24) including a pivoted arm (25) having attachment means (29) at one end adapted to releasably secure a carton blank (17) thereto, and a pressure member (30) arranged in the path of travel of the pivoted arm (25) whereby a carton (17) secured thereto is engaged by the pressure member (30) as it moves from the delivery position (22) to the holding station (38) such that it is forced into an at least partially erected condition.

9. Apparatus according to anyone of claims 1 to 8, characterized in that a delivery conveyor (59) is provided leading from one of said holding stations (38) and a movable actuating member (57) is also arranged adjacent an inlet to said delivery conveyor (59) to move a carton (17) from the adjacent holding station (38) into the delivery conveyor (59) whereby the gripping means (41) will push said carton along the delivery conveyor (59) when said carriage (36) is rotated.

10. Carton feed apparatus comprising a feed magazine (12) for folded carton blanks characterized in that said magazine includes a substantially horizontal conveyor (15) for supporting a plurality of folded carton blanks (17) with the lower edge thereof rested upon the conveyor (15) and the blank extending upwardly therefrom, a downwardly inclined ramp (18) at one end of the conveyor (15) to receive the blanks therefrom, the ramp (18) having an inclination whereby the blanks will move by gravity to the lower end thereof with the lower edge of the blanks rested upon the ramp (18), and drive means (16) to operate the conveyor (15) to feed blanks (17) to the upper end of the ramp (18).

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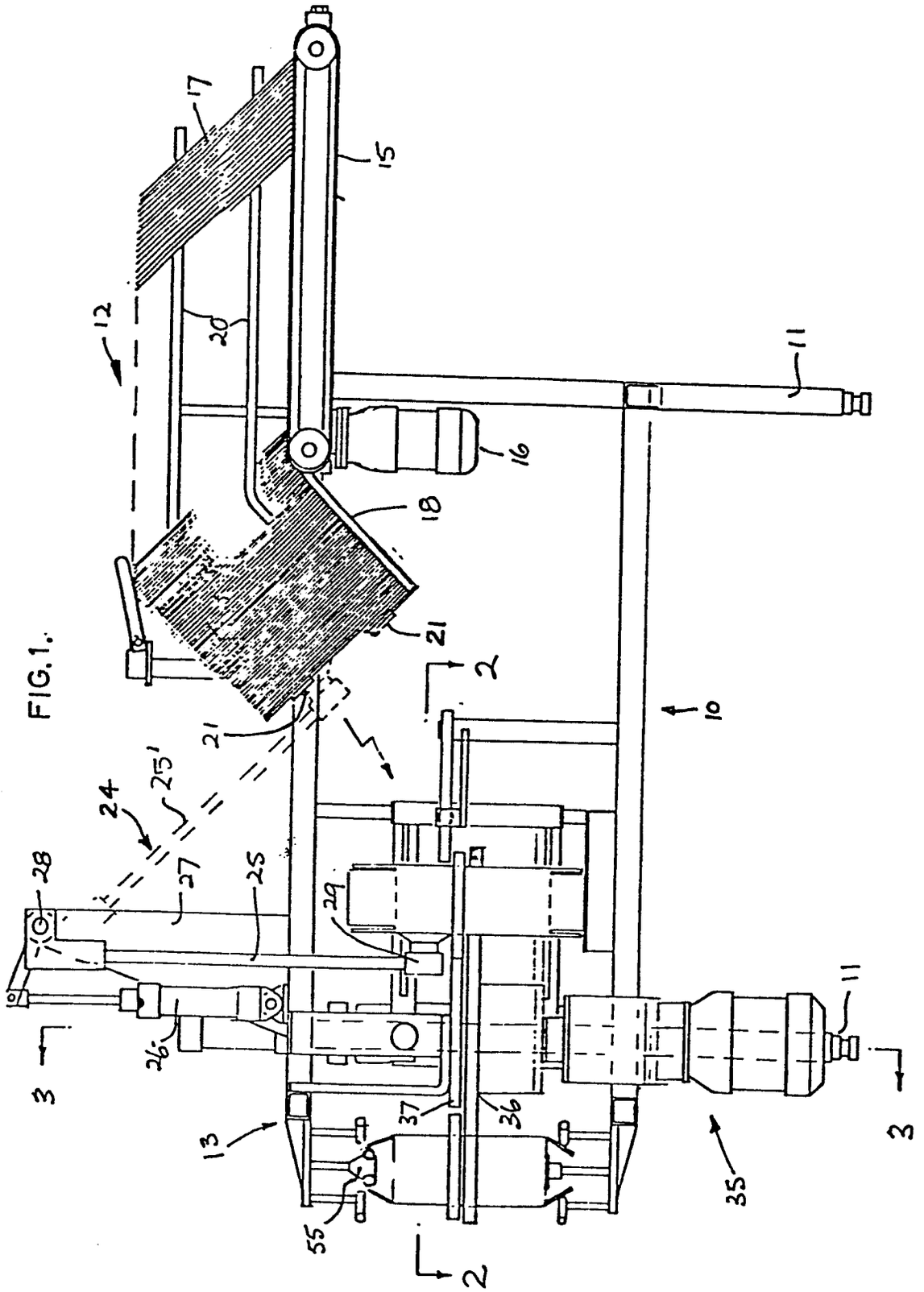

FIG.1.

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FIG.3.

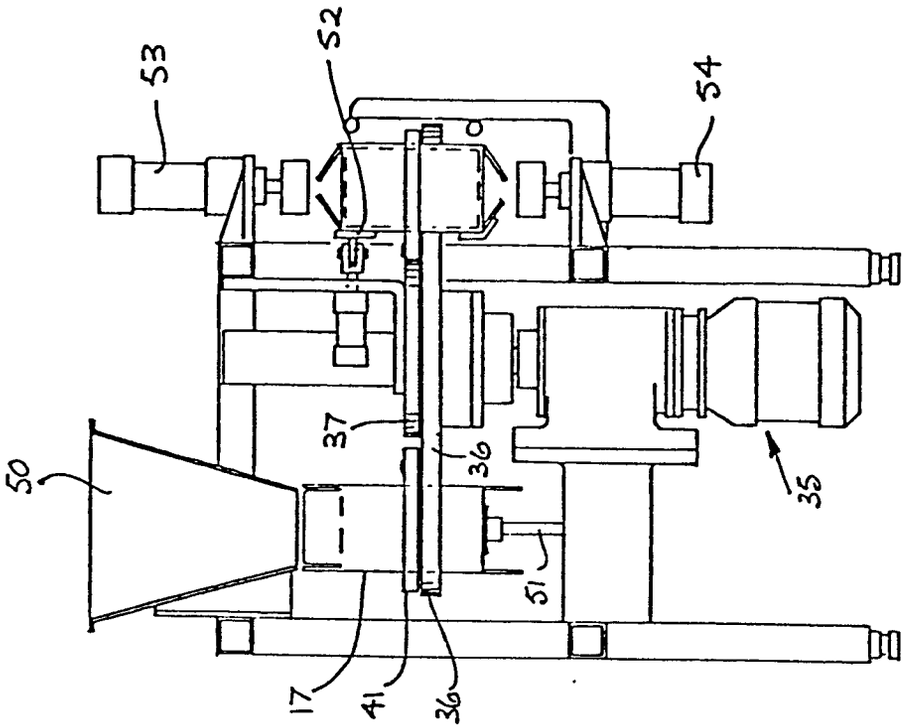

FIG. 4.

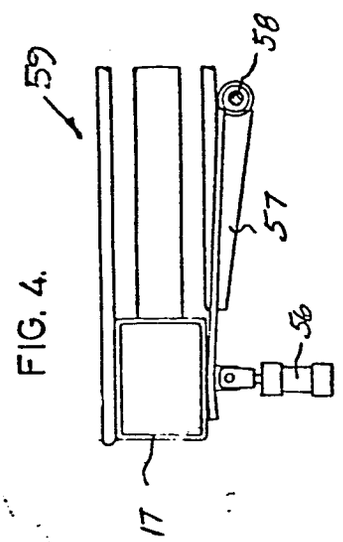

FIG. 2.