United States Patent

[11] 3,533,333

[72] Inventor **Daniel McIntyre**
Portland, Connecticut

[21] Appl. No. **717,834**
[22] Filed **April 1, 1968**
[45] Patented **Oct. 13, 1970**

[73] Assignee **Emhart Corporation**
Bloomfield, Connecticut
a corporation of Connecticut

---

[54] **MACHINE FOR ERECTING CASES**
8 Claims, 6 Drawing Figs.

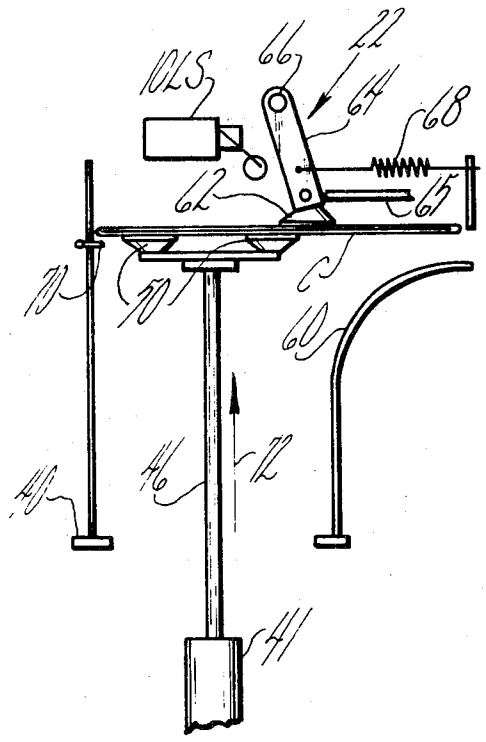
[52] **U.S. Cl.** **93/53**
[51] **Int. Cl.** **B31b 1/76**
[50] **Field of Search** ..... 93/53, 53(OR), 53(M), 53(PSD); 53/186

[56] **References Cited**
UNITED STATES PATENTS

3,074,326	1/1963	Engleson et al.	93/53
3,293,998	12/1966	Farnow	93/53

Primary Examiner—Bernard Stickney
Attorney—McCormick, Paulding and Huber

ABSTRACT: A machine having a magazine for storing stacked cases in flat folded condition one on top of another, and having a carriage assembly movable horizontally to strip the lowermost case from the stack. Reciprocable first vacuum means draws the underside of the folded case downwardly for erection after said case has been so stripped, while pivotally mounted second vacuum means swingably supports the upper side of the case during at least the initial phase of case erection.



Patented Oct. 13, 1970 3,533,333

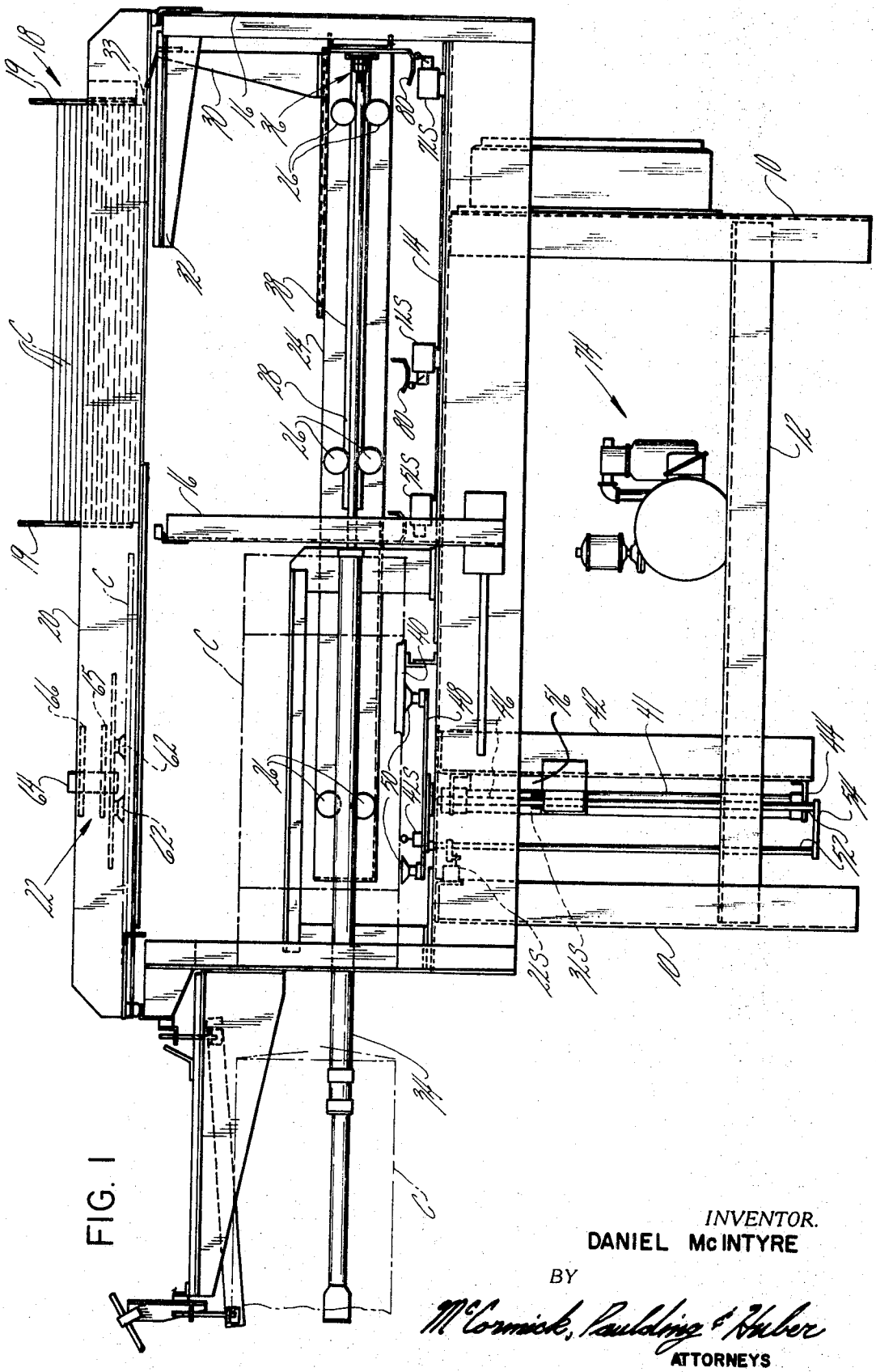
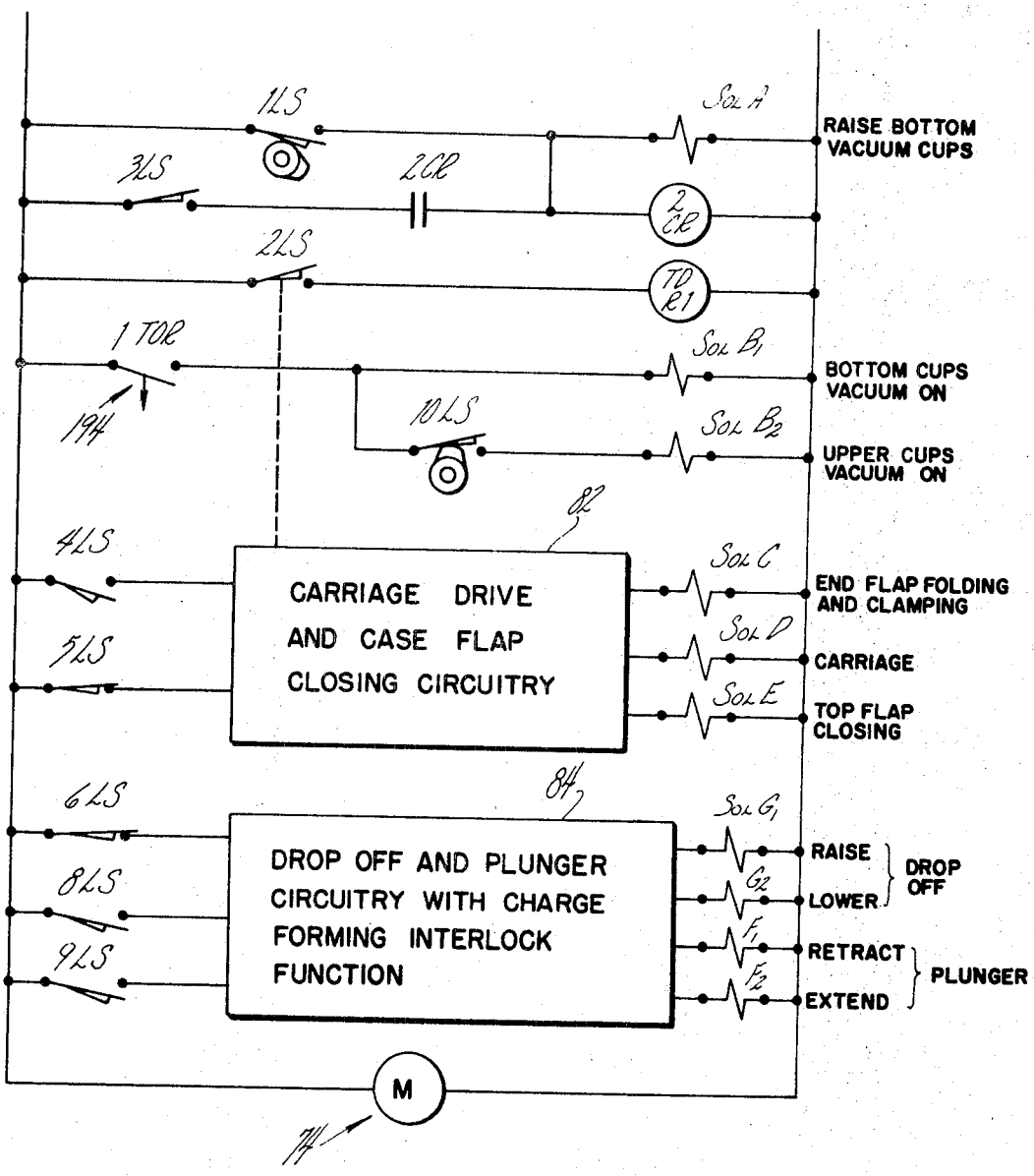


FIG. 1

INVENTOR.
DANIEL McINTYRE
BY
McCormick, Paulding & Huber
ATTORNEYS

FIG. 2


1LS
3LS
2CR
2LS
1 TDR
194
10LS
4LS
5LS
6LS
8LS
9LS
82
CARRIAGE DRIVE AND CASE FLAP CLOSING CIRCUITRY
84
DROP OFF AND PLUNGER CIRCUITRY WITH CHARGE FORMING INTERLOCK FUNCTION
M
74
Sol A
Sol B1
Sol B2
Sol C
Sol D
Sol E
Sol G1
G2
F1
F2
RAISE BOTTOM VACUUM CUPS
BOTTOM CUPS VACUUM ON
UPPER CUPS VACUUM ON
END FLAP FOLDING AND CLAMPING
CARRIAGE
TOP FLAP CLOSING
RAISE
LOWER
DROP OFF
RETRACT
EXTEND
PLUNGER

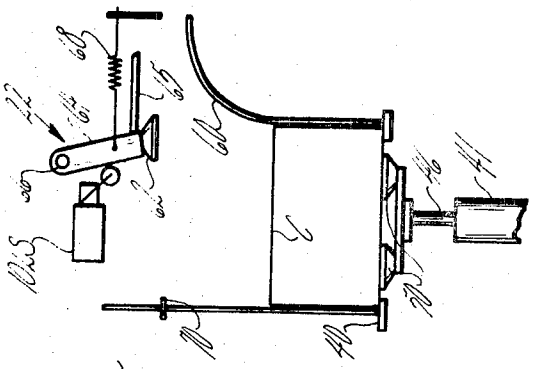


FIG. 6

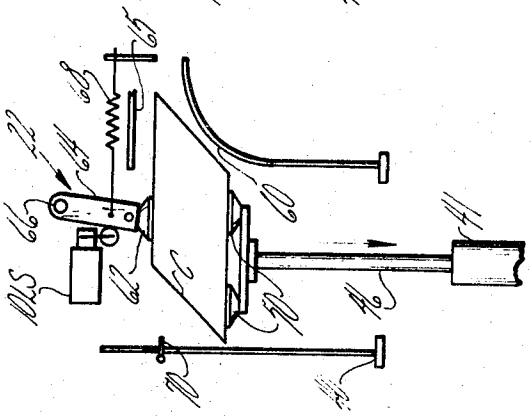


FIG. 5

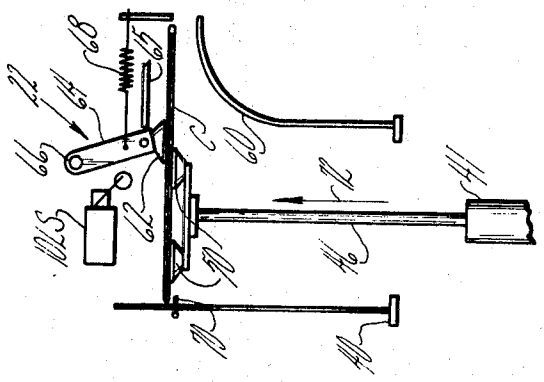


FIG. 4

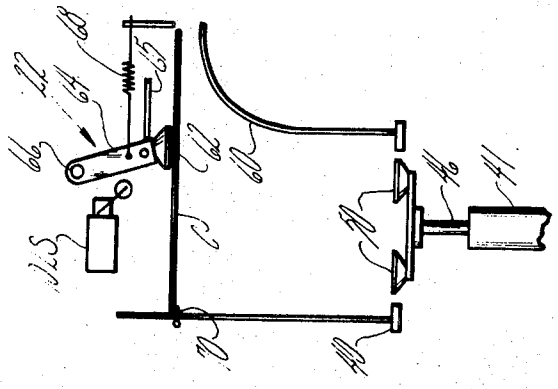


FIG. 3

MACHINE FOR ERECTING CASES

SUMMARY OF INVENTION

This invention relates to machines for erecting cases from the flat, and deals more particularly with an improved machine of the type disclosed in my copending U.S. Pat. No. 3,412,652 Ser. No. 615,778, filed February 13, 1967, and entitled "Machine for Erecting Cases and Positioning Them For Loading."

A general object of the present invention is to provide a machine for erecting cases having many of the advantages of the machine disclosed in the above-mentioned patent, that is, having an improved case erecting and case transferring means both of which are operable in timed relationship with one another and with the plunger and drop-off mechanism of a conventional case packer.

A more specific object of the present invention is to provide a case erecting machine having an improved vacuum operated means for opening or erecting the case, which improved means is operable in cooperation with the vacuum operated and case camming means for erecting cases disclosed in the above-mentioned patent.

The drawings show a preferred embodiment of the invention and such embodiment will be described, but it will be understood that various changes may be made from the construction disclosed, and that the drawings and description are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a side elevational view of a machine for erecting cases, with portions of a case packer being indicated schematically at the downstream or left hand end, which case packer may be identical to that described with reference to the above-mentioned patent.

FIG. 2 is a schematic wiring diagram showing the various limit switches and some of the relays for automatic operation of the upper and lower vacuum means used to erect cases in the machine of FIG. 1. The relays and switches required for operation of the components of the machine with are similar to those disclosed in the above-mentioned patent are shown in block diagram form for simplicity.

FIGS. 3, 4, 5 and 6 show the sequence of operation of the upper vacuum means illustrating the manner in which said vacuum means is timed with respect to the lower vacuum means of the type described in the above-mentioned patent application.

DETAILED DESCRIPTION

Turning now to the drawings in greater detail, FIG. 1 shows, inside elevation, a machine for erecting or opening flat cardboard shipping cases and for positioning in each open case on the packing funnel of a conventional case packing machine. The machine shown comprises a fixed frame having four legs 10, 10 which legs are interconnected by shelf brackets 12, and carry at their upper ends a table portion 14. Six post members 16, 16 are attached to the side edges of the table portion 14 and extend upwardly to support the case magazine, indicated generally at 18. The case magazine 18 comprises four corner posts 19, 19, each of which is supported on an upper frame 20 carried at the upper end of the post member 16, 16. This upper frame 20 also carries an upper vacuum means 22 to be described in greater detail hereinbelow.

Means is provided for cyclically stripping the lowermost case from the magazine and moving said case in its flat condition from right to left in FIG. 1 from a lowermost position at the bottom of the magazine to a case erecting position just below the upper vacuum means 22. Preferably and as shown in FIG. 1, said means comprises a split carriage assembly which is mounted in the fixed frame of the machine for movement between the case erecting position shown and a "loading" position to the left of the illustrated position. The

carriage assembly portion illustrated in FIG. 1 includes a longitudinally extending member 24 upon which are rotatably mounted three pairs of rollers 26, 26 all of which rollers ride on a longitudinally extending guide rod 28 mounted in the fixed frame of the machine. The carriage member 24 carries upright stanchions 30, 30 at its right hand end. The upper ends of the stanchions 30 carry stripper plates 33, 33 mounted thereon for stripping the lowermost case from the magazine and moving said case toward the left in response to movement of the carriage assembly from the position shown. While one side of the split carriage assembly has been described hereinabove, it will be appreciated that the opposite side is similarly constructed and can be adjusted toward and away from the portion shown for accommodating cases of various widths. The reader is referred to the above-mentioned copending application of the applicant herein for a more complete description of the split carriage construction. Horizontal reciprocatory movement of the carriage assembly is achieved through horizontally disposed air cylinders 34, 34 which have a fixed portion carried in the machine frame and a movable portion connected to the carriage assembly as indicated at 36. Various limit switches 1LS, 5LS and 7LS to be discussed in greater detail hereinbelow are associated with reciprocatory motion of the piston rod 38 to detect various positions of the carriage assembly.

As described more completely in the above-mentioned copending application of the applicant herein, vertically reciprocable means is mounted in the fixed frame of the machine for drawing a horizontally disposed case, indicated generally at C, which case will have been previously stripped from the magazine, generally downwardly onto a stationary platform 40. The platform 40 is fixed to the table portion 14 of the frame and has an opening (not shown) through which said means moves. The vertically reciprocable means preferably comprises a fluid motor 41 having a cylinder which is vertically disposed and attached to the fixed frame of the machine by a bracket 42. The bracket 42 is connected at its upper end to the table portion 14 and carries forwardly extending legs 44, 44 fixedly attached to the upper and lower ends of the fixed cylinder portion of the fluid motor. The fluid motor 41 also includes a movable portion including a piston rod 46 connected to a horizontal plate 48 upon which are mounted four vacuum cup assemblies 50, 50. Two guide rods 52, 52 are connected at their upper ends to the plate 48 and at their lower ends to a second plate 54. A slide block 56 is secured to the bracket 42 and defines guide openings for slidably receiving the guide rods 52, 52. A limit switch 2LS is provided with an actuating arm which is moved in response to initial upward movement of the plate 48 and is returned to the position shown when the plate 48 and its associated vacuum cups 50, 50 are retracted. The vacuum cups 50, 50 and their associated plate 48 move through the opening (not shown) in the stationary platform 40. As so arranged, the cups 50, 50 serve to engage the underside of the stripped case positioned thereabove, and to draw it downwardly as best shown in FIGS. 3, 4, 5, and 6.

Referring now more particularly to FIGS. 3 through 6 inclusively, a camming surface 60 is preferably provided below the stripped case C (FIG. 3) for causing the downwardly moving case to be erected or opened as shown in FIGS. 5 and 6. As described in the aforementioned patent application said camming surface 60 comprises an arcuate side wall which is adjustably supported on suitable means extending respectively from a post 16 and from the frame 20 so as to permit cases of various size to be accommodated.

In accordance with the present invention, vacuum cups 50, 50 are provided for engaging the underside of the flat folded case C so as to draw the case downwardly as shown in FIGS. 5 and 6, and in addition second vacuum means 22 are provided for releasably engaging the upper side of the flat folded case C so as to assist in the case erection function performed by the camming surface 60. As shown schematically in these views, said upper vacuum means 22 comprises a plurality of vacuum

cups 62, 62 all of which are pivotally mounted at the free end of a lever 64, which lever is swingably mounted on a rockshaft 66 in the fixed frame of the machine. The lever 64 is held in the position shown in FIG. 3 against a stop 65 by spring biasing means 68 in the form of a tension spring provided between the fixed frame of the machine and a point on the lever 64 intermediate the free end thereof and the pivoted end as shown. It is noted that the flat folded case C which has been stripped from the magazine and positioned as shown in FIG. 3 is located a slight distance below the vacuum cup 62, resting as it does against a small spring loaded hinged abutment surface 70. Thus, and as shown in FIG. 4, when the lower vacuum means is raised in response to extension of the fluid motor 41 in the direction of the arrow 72, the flat folded case C is lifted slightly off the abutment 70 so as to engage the upper vacuum cup 62. Both the upper and lower vacuum cups will have been energized, or connected to a source of vacuum indicated generally at 74 in FIG. 1, and therefore the case C in FIG. 4 will be immediately engaged and held against vacuum cup 62 as a result of this upward movement. When the fluid motor 41 and more particularly its piston rod 46 reaches the upper limit of travel, a limit switch 3LS opens causing the piston rod 46 to return, as shown in FIG. 5, to its retracted position. During retraction, the lever 64 upon which the upper vacuum cup 62 is mounted will move away from the stop 65 as a result of having engaged a particular portion of the flat folded case C shown in FIG. 4. That is, the case C during erection must have one or the other of its bottom and top sides translate horizontally as the parallelogram shape is followed from the flat condition of FIG. 4 to the rectangular or erected position of FIG. 6. As a result of engaging the upper side of the case C, the upper vacuum cup 62 holds the upper side of the case in the same horizontal plane as was occupied by the flat folded case in FIG. 4 until a limit switch 10LS is opened shutting off the source of vacuum to the upper vacuum cup 62 as depicted in the schematic drawing of FIG. 2. Once the vacuum is interrupted to the upper vacuum cup 62, the partially erected case C will be engaged by the camming surface 60, and will be erected to the position shown in FIG. 6 in substantially the same manner as described in the above-mentioned patent application.

As described in the above-mentioned patent application, when the erected case C reaches the position shown in FIG. 6, (and also shown in FIG. 1) said case engages a limit switch 4LS to initiate operation of suitable means for closing the rear end flaps of the erected case. As described in the above-mentioned patent application said last-mentioned means also serves to clamp the erected case in position on the carriage assembly so that the erected case can be moved from the position shown to a position on the funnel portion of the conventional packer. The reader is referred to the applicant's above-mentioned patent application for a more complete description of the various end flap closing mechanisms, and for a more complete description of the operation of the present machine's conventional components, especially their operation in timed relationship with the packer mechanism itself.

Turning now to a more detailed description of the operation of the present machine, and referring more particularly to FIG. 2, solenoid A operates a valve which controls the air to the cylinder 41 for raising the vacuum cups 50, 50. Solenoid B1 operates a valve located between the vacuum pump 74 and the vacuum cups 50, 50. Solenoid B2 operates a valve located between said vacuum pump 74 and the upper vacuum cups 62, 62. The remaining solenoids C, D, E, G1, G2, F2, and F1 serve the same function as that described in the above-mentioned patent application and need not be described in detail herein. As in the previous machine, a limit switch 1LS serves to cyclically operate the present machine and closes momentarily during normal operation as the erected case clears the vacuum cups 50, 50. At any other position of the carriage assembly, including the rest position shown in FIG. 2, limit switch 1LS is opened. Thus, solenoid A will be energized cyclically in response to closing of switch 1LS. A depending bracket 80 on the underside of the carriage assembly serves to close switch 1LS and to thereby energize solenoid A when the erected case C leaves the stationary platform 40. Control relay 2CR is energized whenever solenoid A is so energized and once relay 2CR is energized, limit switch 3LS controls solenoid A. Limit switch 3LS is normally closed and will be opened after a built-in mechanical time delay once the vacuum cups 50, 50 have reached their upper limit of travel. This mechanical time delay assures that a maximum vacuum is developed in the vacuum cups 50, 50 prior to the downward movement thereof associated with erection of the flat folded case as shown in FIGS. 3 through 6 inclusively.

Limit switch 2LS is also normally closed but is held open when the vacuum cups are in the position shown in FIG. 2 so that time delay relay TDR1 is energized as soon as the vacuum cups 50, 50 are moved upwardly. Time delay relay TDR1 has normally opened contacts 194 associated therewith, which will be closed as soon as this relay TDR1 is energized. The contacts 194 will remain closed for a predetermined delay after time delay relay TDR1 is de-energized to assure that solenoid B1 remains energized during operation of the rear end flap closing cylinders. Prior to the expiration of the time delay incorporated in TDR1, limit switch 10LS will be opened as shown in FIG. 5 in order to release the partially erected case for the remainder of its travel along the camming surface 60 to the erected position shown in FIG. 6.

Limit switch 4LS is associated with the platform 40 to detect an erected case thereon. When 4LS closes, solenoid C is energized and the rear end flap closing cylinders are actuated. Normally opened switch 7LS is held closed whenever the carriage assembly is located at the platform station by the depending arm 80. Limit switch 5LS, on the other hand, closes when the carriage assembly has reached the funnel position and control circuitry, indicated generally at 82, is provided as in the above-mentioned patent application for causing the flap closing arms and the clamping members to return to their inactive positions. Limit switch 5LS also controls return air to the cylinders 34 for returning the carriage to the position shown in FIG. 2 through a solenoid D and switch 5LS also operates the top flap closing cylinder through solenoid E.

As mentioned hereinabove, the packer with which a machine of the present invention can be adapted for use may be identical to that shown and described in the above-mentioned patent application and includes a drop-off arm and a plunger both of which are linked through suitable circuitry, indicated generally at 84, for timed operation with respect to the present machine. Limit switches 6LS, 8LS, and 9LS are provided for this purpose and are more completely described with reference to the above-mentioned patent application.

I claim:

1. A machine for erecting cases and positioning them on the funnel of a case packer for loading comprising a magazine for storing a stack of flat folded cases, means for cyclically stripping the lowermost case from the magazine for horizontal movement in the plane of said case to a case erecting position, vertically reciprocable first vacuum means below said case erecting position for releasably engaging the underside of the case at said position to draw it downwardly, a cam for erecting said case as it is drawn downwardly, second vacuum means above said case erecting position for releasably engaging the upper side of the case during at least a portion of the downward movement of said first vacuum means, and means for pivotally mounting said second vacuum means to allow the upper side of said case to move horizontally with respect to its underside during said portion of downward movement of said first vacuum means, said pivotally mounted second vacuum means being moved in at least one direction solely by the camming action of said cam on said case during erection.

2. The combination set forth in claim 1 further characterized by a carriage assembly movably mounted in the machine frame, drive means for moving said carriage assembly laterally between a first position and a second position wherein the erected case is placed on the funnel for loading,

said means for stripping the lowermost case from said magazine comprising means carried on said carriage assembly and operable to strip cases successively from said magazine as said carriage assembly moves from said first to said second position.

3. The combination set forth in claim 2 further characterized by a fixed platform for supporting said erected case in the path of movement of said carriage assembly, and control means for deactivating both said vacuum means so that said erected case can be moved off said platform during said lateral movement of said carriage assembly between its first and second positions.

4. The combination set forth in claim 3 wherein said control means for deactivating said second vacuum means comprises a limit switch located in the path of movement of said second vacuum means and operable to deactivate said second vacuum means prior to the deactivation of said first vacuum means at a time when said case is partially erected, and camming means for engaging said case as it is drawn downwardly beyond the position at which deactivation of said second vacuum means occurs to complete the erection of said case.

5. The combination set forth in claim 4 and further characterized by vertically reciprocable means for moving said first vacuum means in timed relationship with said lateral movement of said carriage assembly, said carriage assembly including split carriage portions movable in unison with one another at either side of said vertically reciprocable means so that a flat folded case can be erected as long as the previously erected case has cleared said vertically reciprocable means.

6. The combination set forth in claim 4 wherein said second vacuum moving and mounting means comprises a lever pivotally mounted at its upper end, and wherein said second vacuum means further comprises at least one vacuum cup pivotally mounted at the lower free end of said lever, and means for biasing said lever to an initial position, said case during erection causing said lever to pivot toward a second position and causing said vacuum cup to translate substantially horizontally as aforesaid.

7. The combination set forth in claim 5 wherein said first vacuum means includes a plurality of vacuum cups which move upwardly through an opening in said fixed platform, and wherein said control means is operable to time upward movement of said vacuum cups with respect to movement of said carriage assembly portions from said first to said second positions so that a second case can be erected while the first case is being loaded.

8. The combination set forth in claim 7 wherein said second vacuum mounting and moving means comprises a lever pivotally mounted at its upper end in the machine frame, and wherein said second vacuum means further comprises a plurality of vacuum cups all of which are pivotally mounted in depending relationship at the lower free end of said lever, and biasing means between the machine frame and said second vacuum means for urging the latter toward an initial position, said case during erection causing said lever to pivot toward a second position against the force of said biasing means and causing said vacuum cups to translate substantially horizontally as aforesaid.