Sept. 11, 1962 R. L. GILBERT 3,053,153

CONTAINER FORMING APPARATUS

Filed April 7, 1960 4 Sheets-Sheet 1

Fig. 1

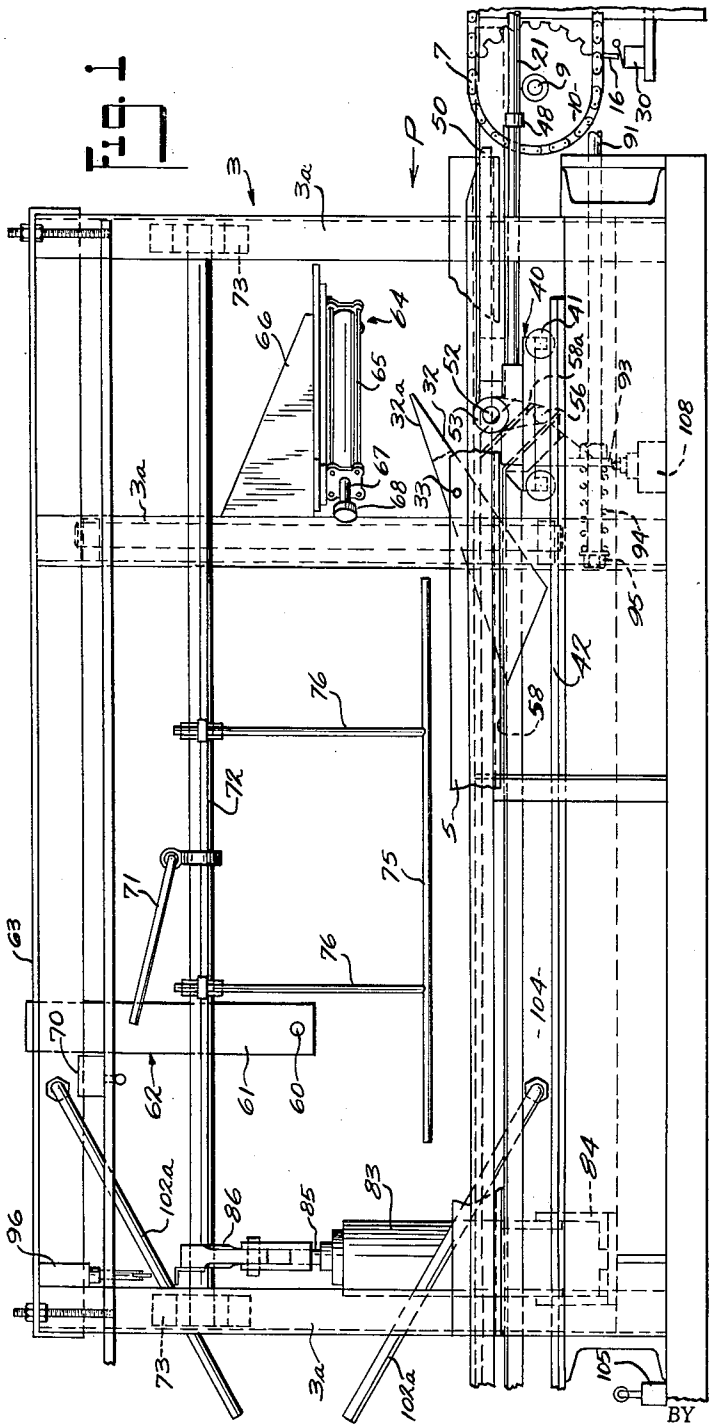
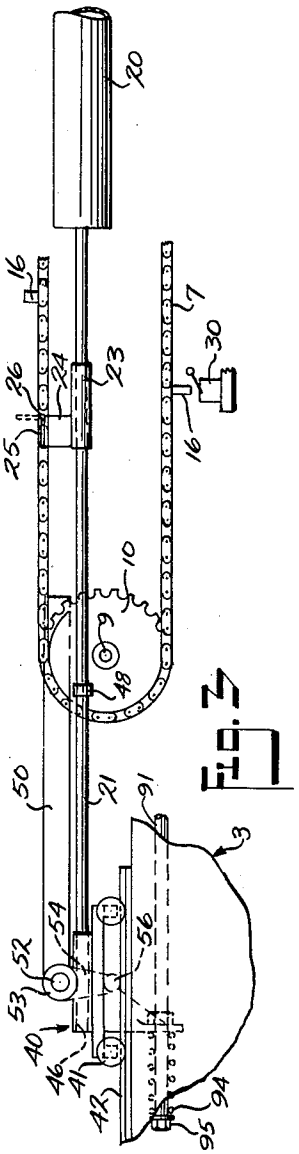


Fig. 2



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CONTAINER FORMING APPARATUS

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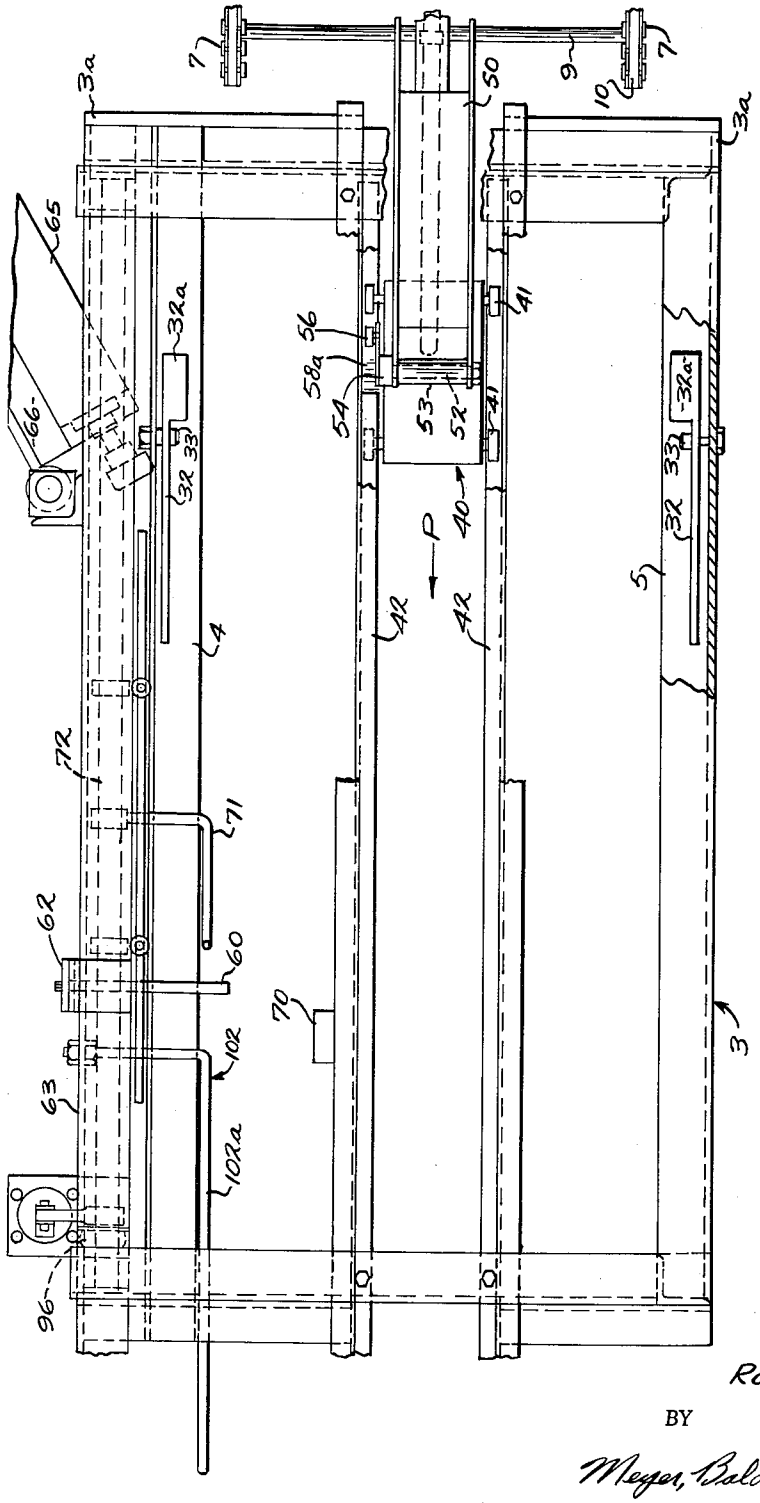


Fig. 2

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CONTAINER FORMING APPARATUS

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FIG. 4

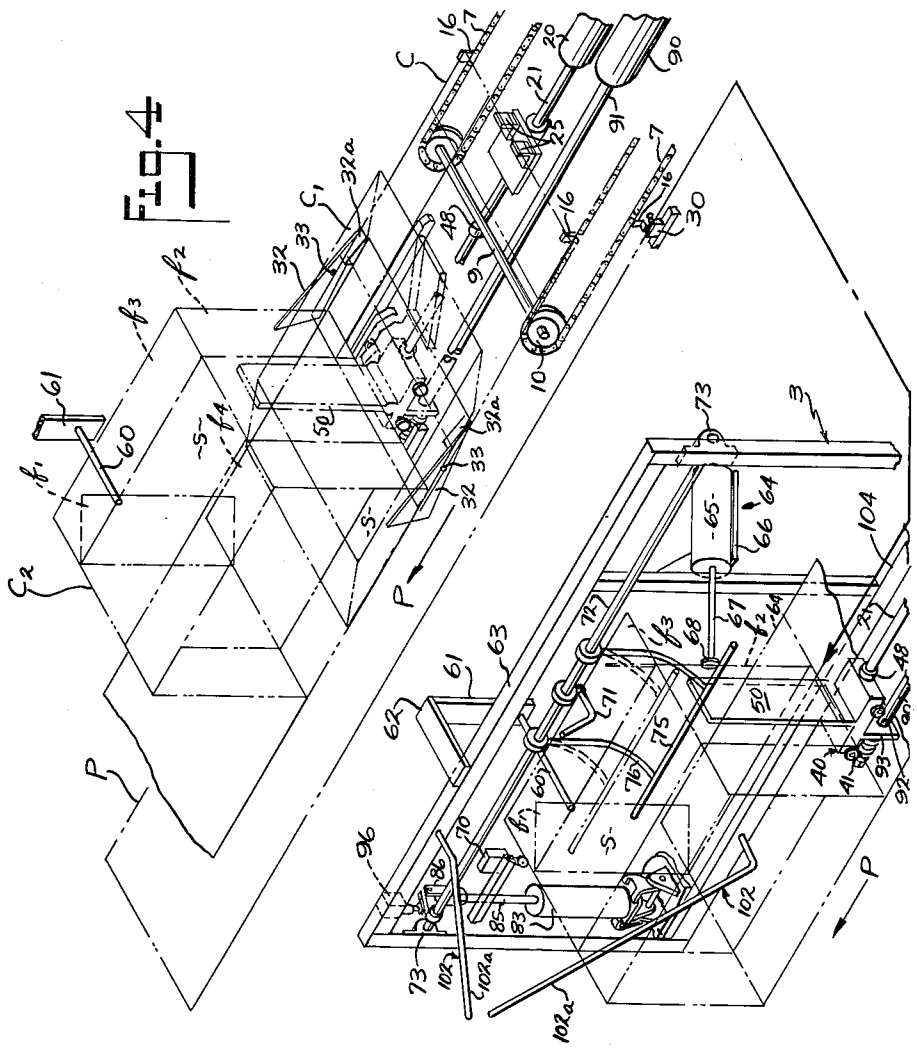
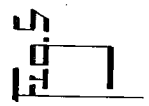


FIG. 5



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CONTAINER FORMING APPARATUS

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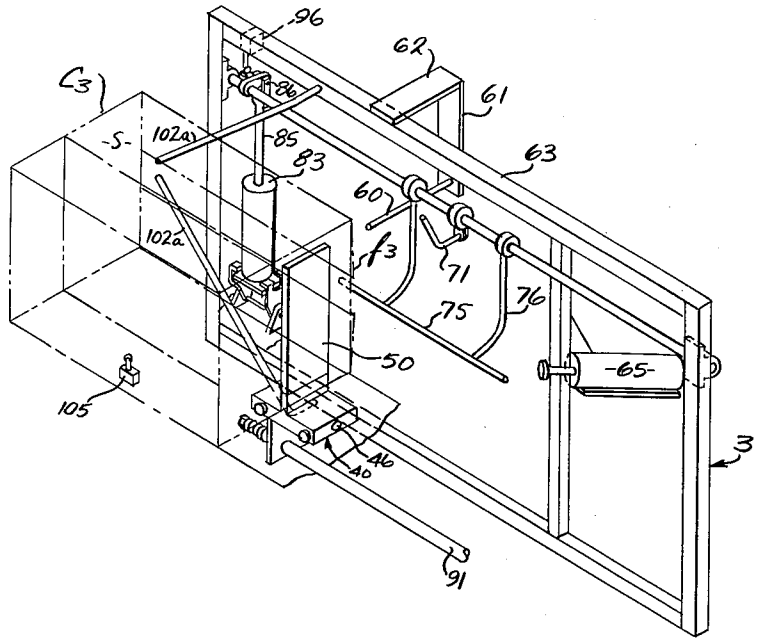


Fig. 6

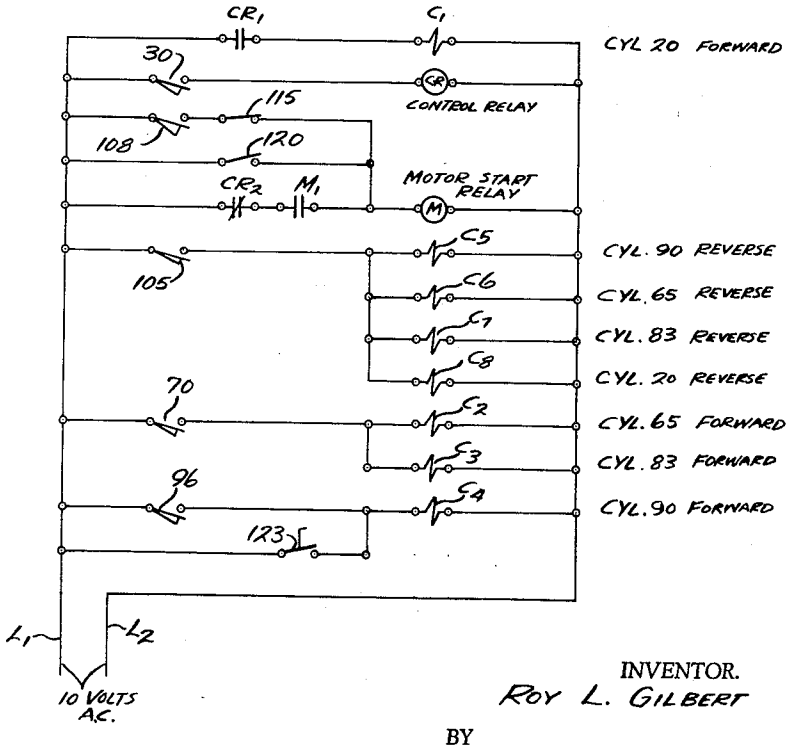


Fig. 7

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United States Patent Office 3,053,153 Patented Sept. 11, 1962

3,053,153

CONTAINER FORMING APPARATUS

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Filed Apr. 7, 1960, Ser. No. 20,756
4 Claims. (Cl. 93—53)

This invention relates to new and improved case forming apparatus, especially designed to erect a collapsible case, container, and the like, from its collapsed folded condition to it erected-article receiving condition.

A primary object of the present invention is the provision of new and improved apparatus for use in automatically erecting a collapsible case, container, and the like, from its collapsed condition to its erected-article receiving condition.

Another object of the present invention is the provision of new and improved case forming apparatus for use in automatically erecting a collapsible case, container, and the like, from its collapsed condition to its erected-article receiving condition, and wherein said apparatus is automatically sequentially operable to erect the shell portion of the container, fold the closure flaps at one end of said shell portion to their closed or sealing position over said one end, and to thereafter dispose said container as thus erected so as to locate the same with its open end in article receiving position.

Still another object of the present invention is the provision of new and improved case forming apparatus for use in automatically erecting a collapsible case, container, and the like, from its collapsed condition to its erected-article receiving condition and wherein said apparatus includes means for advancing a collapsible container along a conveyance path with the closure flaps of said container extending outwardly from opposite sides of the shell portion of said container and toward opposite sides of said path, means for erecting the shell portion of said case, and means for sequentially folding the closure flaps on one end of said shell portion to closed or sealing position over said one end, said conveyance means being thereafter operable to dispose the container, as thus erected, so as to locate its open end in article receiving position.

Additional objects and advantages of the case forming apparatus of the present invention will be realized by one skilled in the art to which it pertains, and upon reference to the following description of a preferred embodiment thereof, and as is illustrated in the accompanying drawings, wherein:

FIG. 1 is a side elevational view of a preferred embodiment of case forming apparatus embodying the concepts of the present invention;

FIG. 2 is a plan view;

FIG. 3 is a fragmentary elevational view showing one form of feed conveying means for the instant apparatus;

FIG. 4 is a pictorial view of the case forming apparatus and showing several of the positions occupied by the collapsible container during its erection cycle and the components of said forming apparatus operating to move said container to said several positions;

FIG. 5 is a pictorial view similar to FIG. 4 and showing the position occupied by the container later in the erection cycle;

FIG. 6 is a pictorial view also similar to FIG. 4, and showing the completely erected container being discharged from the instant forming apparatus; and,

FIG. 7 is a schematic electrical wiring diagram of one embodiment of electrical control circuit utilized for automatically controlling the cyclic operation of the several components of the case forming apparatus of the present invention.

Briefly the case forming apparatus of the present invention is especially designed to automatically erect a collapsible case, container and the like, for example a paperboard container, which, in its erected-article receiving condition, has a central shell portion substantially parallelepiped in configuration, said shell portion having closure flaps at each end thereof, the flaps at one of said ends being folded to a closed or sealing position, and the flaps at the opposite end being disposed in an open position to thus accommodate the disposition of an article and/or articles into said shell portion.

The container, in its preformed, collapsed or folded condition, is intended to be presented to the instant forming apparatus, and thereafter carried therethrough along a predetermined conveyance path, in such manner that the connected ends of adjacent side walls of the shell or body portion thereof define the leading transverse edge of the container, and the aforesaid closure flaps project outwardly from the ends of said shell portion toward opposite sides of said conveyance path.

The instant case forming apparatus is intended to automatically sequentially operate to erect the shell or body portion of the container, thereafter fold the aforesaid closure flaps on said one end of said shell into closed position to thus form an erected, open-end container, and to subsequently dispose said erected container with the open end thereof in article-receiving position.

The embodiment of case forming apparatus, as is disclosed herein, is especially designed for use in conjunction with the case loading apparatus disclosed in my copending application, Serial No. 842,718, field on September 28, 1959, wherein an open-ended container K is deposited on table 73 and in position to have a plurality of articles automatically deposited therein, which loaded container is then discharged from said apparatus.

With reference now directed to the drawings wherein like elements are designated by the same reference numeral the embodiment of case forming apparatus disclosed herein is seen to include a substantially rectangular structural framework, identified in its entirety by the reference numeral 3, and which includes a pair of rail members 4 and 5 disposed substantially in parallel spaced relation to each other, preferably in a horizontal raised position as may be best seen in FIG. 1, and which extend longitudinally along said framework, defining thereby a predetermined conveyance path P, being, in addition preferably supported at spaced positions therealong by vertical frame members 3*a*.

Conveyor means are provided to deliver a case or container, in its collapsed condition, as above described, to the inlet end of the instant forming apparatus and upon said rail members 4 and 5, said inlet end being at the right end of the aforesaid framework 3, as viewed in FIG. 1.

For this purpose, as may be best seen in FIGS. 1 to 3, said conveyor means preferably comprises a pair of endless link belts 7 disposed adjacent said inlet end, being substantially in parallel spaced relation to each other and extending in longitudinal prolongation to the aforesaid framework 3. Shaft members 9 (only one of which is herein shown) mount suitable sprockets 10 at the ends thereof over which are passed said link belts, either or both of said shaft members being suitably driven so as to move the upper or container conveying run of said belts from right to left as viewed in FIGS. 2 and 3.

Inasmuch as the instant case forming apparatus of the present invention is intended to be automatically cyclically operable to erect a collapsible case, container and the like, means are provided on said conveyor means to sequentially deliver a plurality of containers to said inlet end of said apparatus.

To accomplish this, pairs of lug members, identified in FIGS. 2 and 3 by the reference numeral 16, are mounted

on the aforesaid link belts 7 at longitudinally spaced points therealong, one of each of said pairs being mounted on one of said link belts, and extending outwardly therefrom, and thus disposed so as to engage the rearmost edge of a container, disposed on said belts being thus effective upon actuation of said link belts to carry said container to said inlet end.

As the container, being identified in its fully collapsed condition by the reference character C, is delivered to the inlet end of the instant forming apparatus, it is thereafter intended to be moved along the aforesaid rail members 4 and 5 and along said conveyance path P to thus initiate the erection thereof.

For this purpose, as may be best seen in FIGS. 3 and 4, a suitable hydraulic cylinder, as identified by the reference numeral 20, is suitably supported preferably between the upper conveyor runs of the endless link belts 7, extending longitudinally centrally therebetween, such that its piston rod 21 projects into the adjacent inlet end of the aforementioned framework 3. Said piston rod 21 is seen to mount a collar 23, the latter, in turn, rigidly carrying an upstanding arm 24 upon which a pair of fingers 25 is pivotally mounted by pin 26. Although not herein shown in detail, said fingers are preferably spring biased to an upstanding position so as to project outwardly and upwardly of the conveyor runs of said belts.

As the collapsed container C is moved by the endless link belts 7 and lug members 16 toward the aforesaid inlet end, said container passes over the aforementioned fingers 25, being thus operable to swing the latter forwardly in the direction of movement of said container and to retain the same in a depressed position substantially coplanar with the upper run of said belts, as may be best seen in FIG. 3.

As the rearward edge of the collapsed container passes over and forwardly of the fingers 25, the latter swing upwardly about their pivotal connection to their aforesaid upstanding position substantially as is shown in dotted lines in FIG. 3 to thus project upwardly and rearwardly of the rearmost edge of the collapsed container. And, upon actuation of the hydraulic cylinder 20 to propel its piston rod 21 into the framework 3 said container is likewise slidably moved along the rail members 4 and 5 and hence forwardly along said conveyance path.

As will now be apparent, the hydraulic cylinder 20 is required to be periodically actuated to sequentially convey a container C along the aforementioned rail members 4 and 5. To accomplish this, I prefer to automatically initiate the operation of said cylinder by one of the lug members 16 that was previously operable to convey the last preceding container along said path. As may be best seen in FIGS. 3 and 4, as the endless belts 7 are driven to carry the container therealong, said previously used lug members are mounted on the same so as to hang downwardly from the bottom or return run thereof.

An electrical switch element 30 connectable in an electrical control circuit, later to be described, is positioned so as to be actuated by one of said downwardly projecting lug members 16, and is thus effective to cause the energization of said cylinder by suitable hydraulic control means whereby its piston rod 21 and fingers 25 mounted thereon initiate the conveyance of said container along said rail members and defined path P.

As will also be later described in greater detail, the actuation of the switch element 30 to energize the cylinder 20 is also preferably effective to temporarily disconnect the endless link belts from their drive and to thereby delay the delivery of the next container C to the forming apparatus until the container now being conveyed through the same has been completely erected.

As the collapsible container C is thus initially moved along the rail members 4 and 5 the instant case forming apparatus is next operable to partially erect the shell portion of the container, said shell portion being identified hereinafter by the reference character S.

For this purpose, as best seen in FIGS. 2 and 4, a pair of triangular shaped lance members 32 is swingably mounted by pin 33 to the upstanding sides of the rail members 4 and 5, closely adjacent the inlet or right end of the apparatus framework 3, said swingable mounting being likewise closely adjacent the rearmost end of each of said lance members so as to normally position said one end in a raised position above the base or container supporting leg of its associated rail member. In addition, said one end of each lance member is preferably integrally formed with a tongue 32*a*.

The aforesaid pin 33 mounting each lance member 32 is likewise positioned sufficiently above the base leg of its associated rail member to permit a container C to pass therebetween. As said container is moved along said rail members 4 and 5 by the aforementioned fingers 25, the leading edge thereof is adapted to engage with the underside of each of the aforementioned lance members 32 downstream thereon from the swingable pin connection 33 which is thus effective to swing said lance members clockwise as viewed in FIG. 4, whereby the tongue portions 32*a* thereof overlie the opposed topmost closure flap members of said container.

And, as the container C continues to be moved longitudinally along the rail members 4 and 5, the tongue portions 32*a* of said lance members are further adapted to project between the rearward transverse edge of said underlying closure flaps and the leading transverse edge of the closure flaps disposed next adjacent thereto and thence between the under surface of the latter and the upper surface of the flap members disposed therebelow and formed integrally with the opposite side walls of the aforesaid shell portion of said container. In this manner, each of said adjacent closure flaps move upwardly along the inclined edge of the lance members 32 being thus effective to "initially crack" or partially erect the shell portion S of said container to a position such as is pictorially indicated in FIG. 4 at position C_1. While said container is being thus moved and partially erected, the underside edge of each of the lance members 32 opposite said inclined edge engages or rests upon the upper surface of each of the aforesaid oppositely disposed closure flaps to thereby retain said opposite side of the shell portion against the base leg of each of said rail members.

With said container partially erected at said position C_1, means are then provided which function to fully erect the aforesaid shell portion and to thereafter provide for the continuation of the conveyance of said container along the aforementioned path.

For this purpose, the instant forming apparatus is seen to include a trolley member identified in its entirety by the reference numeral 40 which, as best seen in FIGS. 1 and 2, is provided with wheels 41 adapted to ride upon a pair of track members 42 likewise carried in the aforementioned framework 3, being mounted therein in such manner as to extend longitudinally therealong in substantial horizontal spaced relation to other and in a plane somewhat below the plane of the aforesaid rail members 4 and 5.

As best seen in FIG. 3, the trolley member 40 is centrally provided with a bore 46 which is adapted to slidably accommodate the free end of the aforementioned piston rod 21 of the hydraulic cylinder 20. Said piston rod 21 is likewise seen to mount a collar 48 which is spaced forwardly on said rod from the collar 23 and spring-biased fingers 25. With the cylinder 20 actuated in the manner as previously described, so as to propel its piston rod 21 into the framework 3, the piston rod 21 is intended to slidably move through the bore 46 until the collar 48 engages with said trolley member.

During this interval, the container C is being conveyed by the aforesaid fingers 25 along the rail members 4 and

5 and at approximately the instant said collar 48 strikes the trolley member 40, the lance members 32 preferably enter between the closure flaps of said container to initiate the partial erection of the shell portion S thereof.

As said collar 48 engages the trolley member 40, the latter is hence moved along its track members 42 by the piston rod 21.

A paddle member 50 is seen to be mounted at its one end upon a spindle 52, the latter being journalled within a bearing 53, said bearing, in turn, being rigidly mounted on the top of the trolley member, and extending substantially transversely thereacross. Said spindle, at its one end, rigidly mounts a follower arm 54, said arm, in turn, carrying a follower 56 at its free end.

As shown in FIG. 1, the paddle member 50 is normally disposed so as to lie rearwardly of the trolley member 40 and between the rail members 4 and 5 so as to be slightly below the plane defined by the upper surface of the base legs of the latter and which is traversed by the container C as it is conveyed along the aforementioned conveyance path to thus permit the collapsed container to pass freely thereover.

At approximately the instant when the lance members 32 project between the aforementioned closure flaps in the manner as is above described, the paddle member 50 is intended to be swung upwardly or in a counterclockwise direction as viewed in FIG. 1 to thus engage with the rearward portion of the shell portion of the container being thereby effective to raise the same to its fully erected position.

For this purpose, a trackway 58 is provided within the structural framework 3 of the instant apparatus, preferably extending horizontally longitudinally therethrough and disposed slightly above the track members 42, and having a downwardly inclined portion 58*a* formed at its rearward end and which terminates at its lower and closely adjacent one of said track members 42.

With the paddle member 50 disposed in its lowered position as above described, the follower arm 54 and follower 56 are preferably disposed so as to hang downwardly from the connected spindle 52 in a position, as is shown in FIG. 1, the follower 56 extending outwardly from said arm 54 and projecting into the lowermost end of the inclined trackway part 58*a*.

With this construction therefore, as the trolley member 40 begins to move from right to left as viewed in FIG. 1 as a result of energizing the cylinder 20, the follower 56 rides upwardly along said inclined trackway part 58*a* and is thus effective to rotate its connected arm 54 and spindle 52, and thereby swing said paddle member in a counterclockwise direction from its lowered to its raised position whereby the shell portion S of said container is moved to its fully erected condition.

With said shell portion of the container C thus erected, the instant forming apparatus is then operable to move the closure flaps on one end of the same into their closed or sealing position as above described.

With reference now directed particularly to FIGS. 1 and 4, the embodiment of forming apparatus disclosed herein is seen to include an elongated feeler bar 60 connected at its one end to the depending arm 61 of a bracket 62, the latter being rigidly attached to an overhead frame member 63 extending longitudinally along the aforesaid framework 3, said feeler bar being preferably disposed so that its free end projects into the conveyance zone traversed by the container C as the same is moved along said conveyance path P.

Said feeler bar is disposed so that when the paddle member 50 swings upwardly to carry the shell portion S of the container C, to its fully erected position, the foremost now vertically disposed closure flap on the rear side of said shell portion, as identified in FIG. 4 by the reference character f_1, strikes the aforesaid projecting end of said feeler bar 60, and is thereby swung partially inwardly toward the adjacent end of said shell portion to thus initiate its being closed thereover.

The oppositely disposed closure flap on said rear side of said shell portion, as is identified in FIG. 4 by the reference numeral f_2, is next intended to be initially moved towards its closed position.

For this purpose, a suitable hydraulic motor, as identified in FIG. 5 by the reference numeral 64, has its cylinder 65 mounted upon a bracket member 66 carried within the apparatus framework 3, at a predetermined position thereon upstream along said path P from the aforementioned feeler bar 60, and in such manner that its piston rod 67 is angled toward the conveyance zone in the direction of movement of said container as it is conveyed along said rail members 4 and 5. The end of said piston rod is preferably seen to carry a disk-shaped abutment 68.

As will be later described in greater detail, the cylinder 64 is intended to be actuated by suitable hydraulic control means not herein shown, and which are energizable by means of an electrical switch element 70 carried within said framework 3, the latter being operated by the container C in response to and preferably by its shell portion being fully erected by the aforesaid paddle member 50. Upon actuation of said motor 64, its piston rod 67 and attached abutment 68 are propelled into the aforementioned conveyance zone to strike the aforesaid closure flap f_2, being thus operable to swing the latter toward the adjacent end of the container shell.

As best seen in FIG. 5, the electrical switch element 70 is preferably operated by the shell portion S as the same is moved by the paddle member 50 to its fully erected condition.

A finger 71 carried within the framework 3 and positioned so that it engages the underside of the aforesaid closure flap f_3 as the shell portion S of said container C is erected, is effective to hold said flap f_3 in a raised position effective to prevent it from interfering with the closing of the flaps f_1 and f_2. Said finger 71 is preferably carried on a shaft member 72 which is seen to be journalled within suitable bearings 73 carried on the vertical frame members 3*a* disposed at the ends of the aforementioned framework 3, said shaft member extending substantially longitudinally along the rear side of the latter.

In this manner therefore each of the vertically disposed closure flaps f_1 and f_2 is initially moved to a partially closed position over the adjacent opening of said shell portion.

It is thereafter desirable, to further provide for moving said partially closed flaps f_1 and f_2 to their fully closed position over said adjacent shell opening, and to maintain the same in said position while subsequently moving or conveying said container along said conveyance path.

For this purpose, I prefer to utilize a closure bar or rod, identified by the reference numeral 75, and which, as is best seen in FIG. 5, is rigidly connected adjacent each of its ends to one end of each of a pair of arm members 76, said arm members being connected at the opposite ends thereof to the aforesaid shaft member 72 so as to be rotatable with the same being thus connected to the latter so as to dispose said closure rod 75 in substantially a horizontal plane and along the conveyance path. With this assembly, the closure bar 75 is normally disposed along the rear side of the framework 3 and to one side of the aforesaid conveyance zone, said position being shown in solid lines in FIG. 5, said bar being movable from said position to a closure flap engaging position, said latter position being shown in dotted lines. For this purpose, a suitable hydraulic cylinder, as is identified by the reference numeral 83 is pivotably mounted to suitable brackets 84 carried within the framework 3 preferably below the aforesaid shaft member 72. Said cylinder is provided with a reciprocally movable piston

rod 85 which is connected at 86 to the aforementioned shaft member 72 preferably closely adjacent one end thereof.

Upon actuation of the hydraulic cylinder 83, the piston rod 85 is intended to be propelled upwardly as viewed in FIG. 5, whereby the shaft member 72 is rotated in a clockwise direction to swing the closure rod 75 laterally into the conveyance zone and against the vertically disposed now partially closed flaps f_1 and f_2 of the said container, being thus effective to move the same into their fully closed position against the adjacent shell opening thereof.

The hydraulic cylinder 83 is preferably actuated by means of the aforementioned electrical switch element 70, simultaneous with the hydraulic cylinder 65, the electric control circuit to accomplish this result being shown in FIG. 7, the cyclic operation of which will be later described in detail. As will be understood in the art, the cylinder 83 is adjusted so that its piston rod 85 moves at a somewhat slower speed than the speed of the piston rod 67 for cylinder 64. This specific relationship is desirable so that the closure flap f_2 is moved by the piston rod 67 of said cylinder 64 to its partially closed position prior to the closure bar 75 being swung to move the latter flap f_2 and its companion flap f_1 to their closed or sealing position, as is above referred to.

Having thus accomplished the erection of the shell portion S of the container C and the disposition of two of the four closure flaps on the rearward end of said shell portion to their closed or sealing position, the instant forming apparatus is next operable to move the remaining two closure flaps on said end to their closed position over the aforesaid flaps f_1 and f_2, and to convey the then completely formed, open-ended container along said conveyance path to the discharge end of said apparatus.

For this purpose, and with reference now directed particularly to FIGS. 1 and 4, the instant case forming apparatus is provided with a hydraulic cylinder 90 supported preferably below the cylinder 20 so as to be substantially in longitudinal prolongation to the framework 3.

The piston rod 91 of cylinder 90 is seen to extend longitudinally centrally into the framework 3, its front end projecting freely through an aperture 92 in anchor plate 93 formed integral with the aforesaid trolley member 40, and depending downwardly therefrom preferably centrally between the track members 42.

A suitable coil spring 94 disposed over the forward end of the piston rod 91, being captured therein between the anchor plate 93 and a suitable fastener 95 disposed on the end of said rod, resiliently connects said anchor plate and trolley member to said piston rod.

With this assembly, the hydraulic cylinder 90 is intended to be actuated so as to propel its piston rod 91 into said framework, being thus effective to move the trolley member 40 along its track members, and convey the container toward a position therefor as is indicated in FIG. 6 by the reference character C_3.

The cylinder 90 is preferred to be actuated subsequent to the closure bar 75 being moved to its flap closing position, and to accomplish this, I prefer to locate an electrical switch element 96 on the framework 3 directly over the piston rod 85 of the hydraulic cylinder 83 and which is actuated by said piston rod upon the latter moving to its uppermost position while moving the aforesaid closure bar to its flap closing position. The electrical switch element 96 is connected into the aforementioned central circuit of FIG. 7 as will be later described, so as to provide an automatic container forming cycle for the instant apparatus.

As the container C is being moved forwardly along the rail members 4 and 5 by the aforesaid trolley member 40 as a result of the actuation of the hydraulic cylinder 90, means are provided to move the remaining two closure flaps f_3 and f_4, as are above identified, to their closed or sealing position over flaps f_1 and f_2.

For this purpose, as may be best seen in FIGS. 1 and 6, a pair of closure rods 102 is fastened to the apparatus framework 3, one of said rods being attached to the aforesaid upper frame member 63, and the other rod being similarly attached to the frame member 104 disposed vertically therebelow.

Each of said closure rods 102 is likewise provided with a flap engaging part, as identified by the reference numeral 102*a*, which is seen to be disposed closely adjacent to and in front of its supporting frame member, being thus located in the aforementioned conveyance path P, extending forwardly therealong and preferably inclined toward each other and toward the center of said framework.

With the container C being moved forwardly along the rail members 4 and 5 defining the aforesaid conveyance path P, the leading edges of the closure flaps f_3 and f_4 are intended to strike against said closure bar parts 102*a* whereby the same are swung inwardly over the previously closed flaps f_1 and f_2. During this interval, the closure bar 75 is held against the flaps f_1 and f_2 to thus maintain the latter in their closed or sealing position.

The container C, as shown in FIG. 6, has been moved to its fully erected position as indicated at C_3 wherein the closure flaps f_1–f_4 are in sealing relation over the rearward end of the shell portion S thereof, the hydraulic cylinder 90 being continuously actuatable so as to move the trolley member 40 along its track members 42 to thus move said container along said conveyance path and to the discharge end of the framework 3.

Although not herein shown, the aforesaid discharge end of the framework 3 may be disposed closely adjacent the container table 73 of the container loading apparatus of my aforementioned copending application, said cylinder 90 having a forward stroke sufficient to move the container C onto the table with its open end facing the loading mechanism of said apparatus and thus in an article receiving position, as above referred to. Although not herein shown, suitable bar elements similar to the aforesaid bar 71 may be carried on the aforesaid framework 3 adjacent the discharge end thereof being operable to hold the closure flaps on the open end of the container C in their rejective open position to facilitate the subsequent loading thereof.

As the erected container is thus discharged from the instant apparatus, it is then desirable to reversibly actuate each of the above mentioned hydraulic cylinders 20, 65, 83 and 90 and return the associated container erecting and conveying components connected therewith to their normal de-actuated or rest positions and hence in readiness to accommodate and erect the next container to be conveyed along the conveyance path P.

To accomplish this, an electric switch element 105 is connected into the aforementioned electrical control circuit, presently to be described in detail, and is attached to the framework 3 so as to be actuated by the trolley member 40 as the latter moves to the discharge end of said framework. The actuation of said switch is effective to simultaneously connect each of the aforementioned hydraulic cylinders to a suitable source of hydraulic fluid whereby each of the latter is reversibly actuated to thereby return its container erecting and/or conveying component to its de-actuated or rest position, as above referred to.

As best seen in FIG. 1, with the reversible actuation of the hydraulic cylinder 90, the trolley member 40 is returned to its normal or rest position on its supporting track members 42 adjacent the inclined trackway part 58*a*. As said member is thus positioned it is intended to initiate the actuation of the endless belts 7 of the delivery conveyor means and thereby feed the next container C to the adjacent inlet end of the aforesaid rail members 4 and 5.

For this purpose, an electrical switch element **108** is mounted within the apparatus framework **3**, and in position to be actuated by the depending anchor plate **93** of the trolley member **40**. Said switch element is preferably what is known in the art as a one-way switch whereby it is actuatable on only the return stroke of said trolley member. Said switch element is connected into the electrical control circuit so as to energize the power source such as the aforementioned electric motor (not shown) for said conveyor means.

With reference now directed to FIG. 7, a preferred embodiment of electrical control circuit is herein disclosed, and is seen to utilize a suitable voltage source of approximately 10 volts, the latter being connected to power leads L_1 and L_2 of said circuit. The components of said circuit are each shown in their normal or de-energized position.

To provide a suitable control for the electric motor (not shown) for the delivery conveyor means, the instant electrical control circuit is seen to include a motor start relay which has one end of its coil M connected to power lead L_2, and the opposite end to a normally open relay contact M_1. The opposite end of said contact M_1 is connected to one end of a normally closed contact CR_2 of a control relay. the opposite end of said contact CR_2 being connected to power lead L_1.

The normally-open contact of the aforementioned electrical switch element **108** is seen to be connected in series with power lead L_1 and a normally-closed, manually operable switch element **115**, the latter being connected to one end of the coil M of the motor start relay thus shunting the aforesaid contacts CR_2 and M_1.

With this circuit configuration, it will be seen that upon the normally-open switch element **108** being actuated by the trolley member **40** to its closed position at the end of a container erecting cycle, the coil M of the motor start relay is energized, to thus provide for the energization of the aforementioned power source (electric motor) for the conveyor means. The contact M_1 of said relay is likewise actuated to its "closed position" thus connecting said coil M directly through the normally-closed contact CR_2 to thereby lock said coil M across the aforementioned power leads L_1 and L_2 and maintain said power source in its energized condition.

The switch element **108** is actuated by the trolley member while the same is moving along its supporting track members **42** and preferably at an instant just before it is brought to rest by the piston rod **91**. Said switch element is maintained in its closed position by said trolley member for a time sufficient to allow the contact M_1 to close and thereby lock in the coil M of the motor start relay. At the expiration of said interval, the trolley member is moved to its rest or de-actuated position whereby the switch element **108** is permitted to move to its normally-open position.

As a result of energizing the aforesaid power source the endless conveyor belts **7** are also driven to carry the next container C to the rail members **4** and **5** of the instant apparatus to thereby initiate the next container erecting cycle.

As said container is deposited on the aforesaid rail members, one of the lug members **16** used to convey the last preceding container as is described above, is carried by its associated link belt **7** to actuate the aforesaid electrical switch element **30** to its "closed" position.

As seen in FIG. 7 the contact of switch element **30** is normally-open, being connected in series with the coil CR of the aforesaid control relay, said series circuit being connected, in turn, across the power leads L_1 and L_2.

Upon actuation of the switch element **30**, the coil CR of said control relay is energized to thus open the normally-closed contact CR_2 thereby de-energizing the coil M of the motor start relay which is effective to stop the aforementioned conveyor link belts **7**.

A normally-open contact CR_1 of said control relay is also seen to be connected in series with a coil C_1 of a conventional solenoid valve, the latter, in turn, being connected to a suitable source of hydraulic fluid and to the aforementioned hydraulic cylinder **20**.

Upon the coil CR becoming energized the normally-open contact CR_1 is likewise closed to thereby energize the coil C_1 of said solenoid valve, and as a result the hydraulic cylinder **20** is connected in fluid circuit with the source of hydraulic fluid effective to actuate said cylinder and propel the piston rod **21** therefore forwardly along the aforementioned conveyance path P, pushing said container therealong whereby the shell portion S of said container is erected.

The switch element **70** is next to be actuated by the shell portion S of the container, as the same is moved to its full erected position by the aforesaid paddle member **50**.

As seen in FIG. 7 the contact of the switch element **70** is normally open and is connected in series with a pair of coils C_2 and C_3 of two separate conventional solenoid valves, said coils being connected in parallel with other so as to be simultaneously energized. Said series circuit, comprising said switch element **70** and solenoid coils C_2 and C_3, is seen to be connected across the aforesaid power leads L_1 and L_2.

Upon the energization of coils C_2 and C_3, the solenoid valves thereof are connected in circuit with the aforesaid source of hydraulic fluid and the hydraulic cylinders **65** and **83**, which is thus effective to actuate the same and propel their piston rods **67** and **85** respectively, whereby the closure flaps f_1 and f_2 of said container are closed, in the manner as is above described.

As will be recalled, upon piston rod **85** of cylinder **83** reaching its uppermost position, it is operative to actuate switch element **96** and cause the movement of the trolley member **40** along the aforementioned conveyance path P and thereby carry the container therealong, during which time the closure flaps f_3 and f_4 are closed and the container as thus formed is moved to the discharge end of the aforesaid framework **3**.

As seen in FIG. 7, the contact of switch element **96** is normally-open and is connected in series with a coil C_4 of a conventional solenoid valve said series circuit being connected in turn across the power leads L_1 and L_2.

Upon closing the switch element **96**, the coil C_4 is energized to thereby actuate its associated valve and connect the cylinder **90** to the aforementioned source of hydraulic fluid whereby the trolley member **40** is moved along the conveyance path P, as is above described in detail to close flaps f_3 and f_4.

As the trolley member **40** approaches the discharge end of the apparatus framework **3**, it actuates switch element **105** which is effective to cause the aforementioned container erecting and/or conveying components to be moved to their rest or de-actuated positions.

As seen in the electrical control circuit of FIG. 7, the contact of switch element **105** is likewise normally-open and is connected in series with a group of four coils C_5–C_8 which are seen to be preferably connected in parallel with each other. Coil C_5 represents the reversing coil for the solenoid valve controlling cylinder **90**; coil C_6 likewise represents the reversing coil for cylinder **65**; coil C_7 represents the reversing coil for cylinder **83**; and coil C_8 represents the reversing coil for cylinder **20**.

The series circuit comprising the switch element **105** and said reversing solenoid coils is seen to be connected across the poder leads L_1 and L_2.

As switch element **105** is thus closed by the trolley member **40**, each of the reversing coils C_5–C_8 is simultaneously energized to cause the hydraulic cylinders **90**, **65**, **83** and **20** corresponding thereto, to return to their rest or de-actuated position as referred to above, to thus await the next container to be erected.

And, as will be further recalled, with the trolley member **40** being moved rearwardly along its track members

42 toward the inlet end of the framework 3, it is operable to trigger the switch element 108 whereby the endless belts 7 of the delivery conveyor means are actuated to carry the next container to be erected to said inlet end of the apparatus framework 3.

As will be seen in FIG. 7, a switch element 120, having a normally-open contact, may be connected in parallel with the aforesaid switch elements 108 and 115 to provide for manually controlling the actuation of the endless belts 7 of said conveyor means.

In like manner, a switch element 123 having a normally-open contact, may also be connected across switch element 96 to provide for manually controlling the forward actuation of the solenoid coil C_4 for the hydraulic cylinder 90.

Having thus described in detail, a preferred embodiment of case forming apparatus and the manner in which it is cyclically operable to erect a collapsible case or container from its collapsed-folded condition to its erected-article receiving condition, it is understood that the same is susceptible to various modifications, combinations and arrangements of parts without departing from the inventive concepts thereof as are defined in the claims.

I claim:

1. Container forming apparatus for erecting a collapsible container having a main shell portion and closure flaps hingedly attached to the ends thereof; means for advancing a collapsed container along a predetermined conveyance path with the closure flaps thereof extending laterally of said path, lance means disposed along said path for entering said container and effective to partially erect said shell portion, means engageable with the trailing end of said partially erected shell portion and operable to move the same to its fully erected position, said last named means being subsequently movable along said path to convey said container in said erected condition therealong, means fixedly disposed in the path of the foremost closure flap on one end of said body portion and responsive to the movement of said case along said path to move said flap into a partially closed position with respect to said one end, means movable into said path as said case is carried along said path for moving the rearmost closure flap on said one end of said body portion into a partially closed position, and means swingable into said conveyance path and engageable simultaneously with said foremost and rearmost closure flaps and operable to move the same into closed position over said one end.

2. Container forming apparatus for erecting a collapsible container having a main shell portion and closure flaps hingedly attached to the ends thereof; means for advancing a collapsed container along a predetermined conveyance path with the closure flaps thereof extending laterally of said path, lance means disposed along said path for entering said container and effective to partially erect said shell portion, means engageable with the trailing end of said partially erected shell portion and operable to move the same to its fully erected position, means for sensing the conveyance of said container along said path being effective to initiate the actuation of said shell portion erecting means, said shell portion erecting means being subsequently movable along said path to convey said container therealong, means actuatable by said shell portion erecting means moving to its shell portion erecting position effective to initiate the movement of said shell portion erecting means along said path, means fixedly disposed in the path of the foremost closure flap on one end of said body portion and responsive to the movement of said case along said path to move said flap into a partially closed position with respect to said one end, means movable into said path as said case is carried along said path for moving the rearmost closure flap on said one end of said body portion into a partially closed position, and means swingable into said conveyance path and engageable simultaneously with the foremost and rearmost closure flaps and operable to move the same into closed position over said one end.

3. Container forming apparatus for erecting a collapsible container having a main shell portion and closure flaps hingedly attached to the ends thereof; means for advancing a collapsed container along a predetermined conveyance path with the closure flaps thereof extending laterally of said path, lance means disposed along said path for entering said container and effective to partially erect said shell portion, a trackway disposed in said apparatus and extending longitudinally along said path, a trolley member rollably movable along said trackway, a paddle member swingably mounted on said trolley member, means connectable with said paddle member and responsive to said trolley member being movable to an erecting position for swingably actuating said paddle member into engagement with the trailing end of said partially erected shell portion effective to move the latter to a fully erected position, means for sensing the conveyance of said container along said path being effective to initiate the actuation of said trolley member to its erecting position, said trolley member being subsequently movable along said trackway to convey said container along said path, means actuatable by said paddle member moving to its shell portion erecting position effective to initiate the movement of said trolley member along said trackway, means fixedly disposed in the path of the foremost closure flap on one end of said body portion and responsive to the movement of said case along said path to move said flap into a partially closed position with respect to said one end, means movable into said path as said case is carried along said path for moving the rearmost closure flap on said one end of said body portion into a partially closed position, and means swingable into said conveyance path and engageable simultaneously with the foremost and rearmost closure flaps on said one end and operable to move the same into closed position over said one end.

4. In container forming apparatus as is defined in claim 3 and wherein cam means are located on said apparatus and operable with follower means connected with said paddle member to swing said paddle member into engagement with the shell portion of said container effective to move the latter to a fully erected position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,651,153	Burnett	Sept. 8, 1953
2,750,856	Ferguson et al.	June 11, 1956
2,846,834	Spriggs	Aug. 12, 1958
2,989,903	Wilcox	June 27, 1961