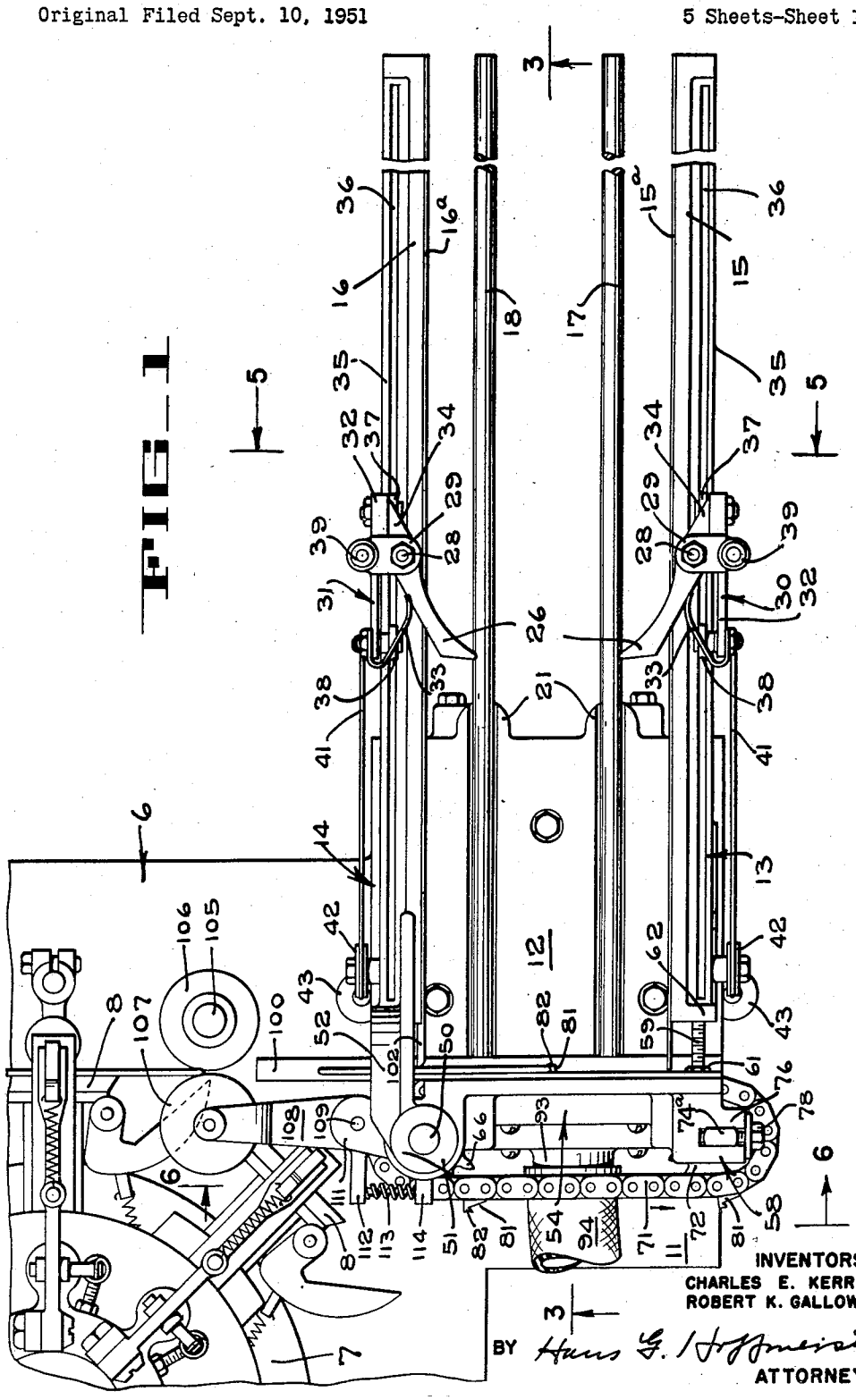
June 24, 1958 C. E. KERR ET AL 2,840,375

CARTON STACK ADVANCING MECHANISM

Original Filed Sept. 10, 1951 5 Sheets-Sheet 1

FIG. 1



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CARTON STACK ADVANCING MECHANISM

Original Filed Sept. 10, 1951 5 Sheets-Sheet 2

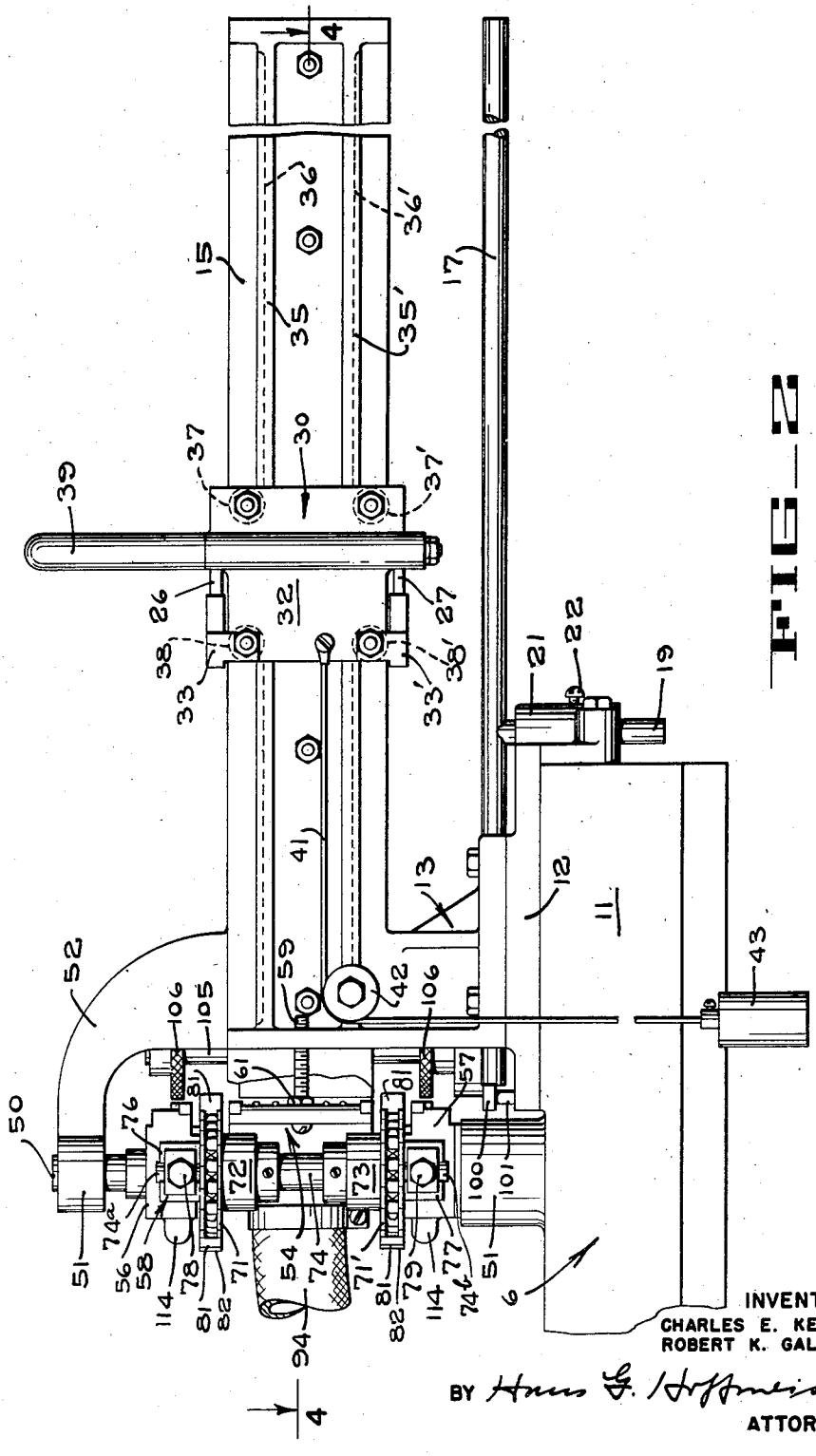

FIG. 2

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CARTON STACK ADVANCING MECHANISM

Original Filed Sept. 10, 1951 5 Sheets-Sheet 3

FIG_3

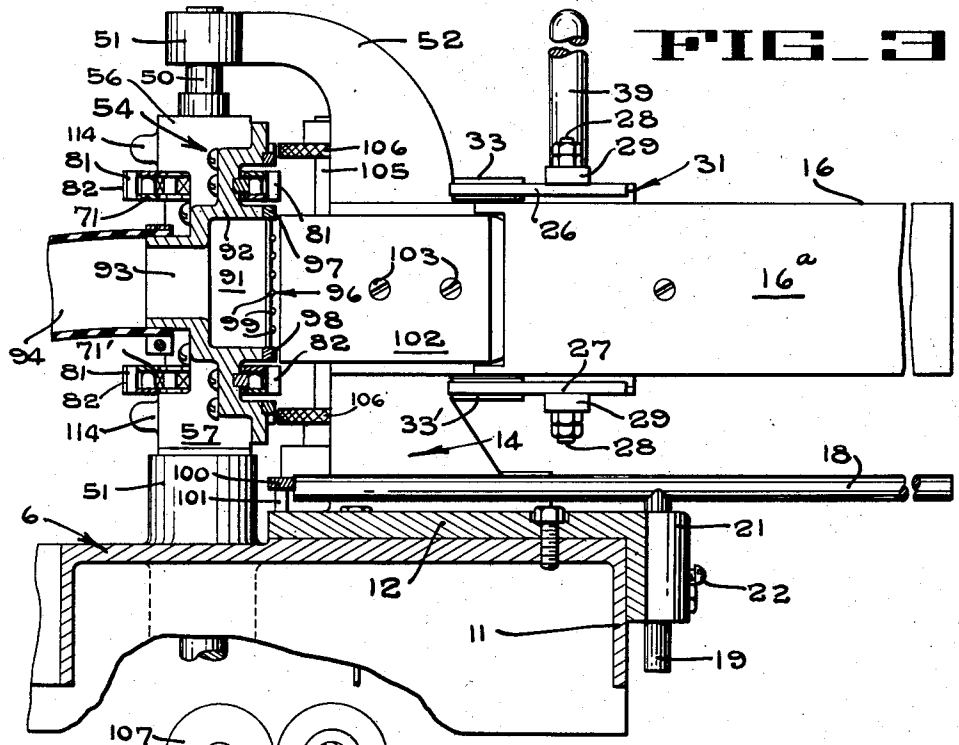
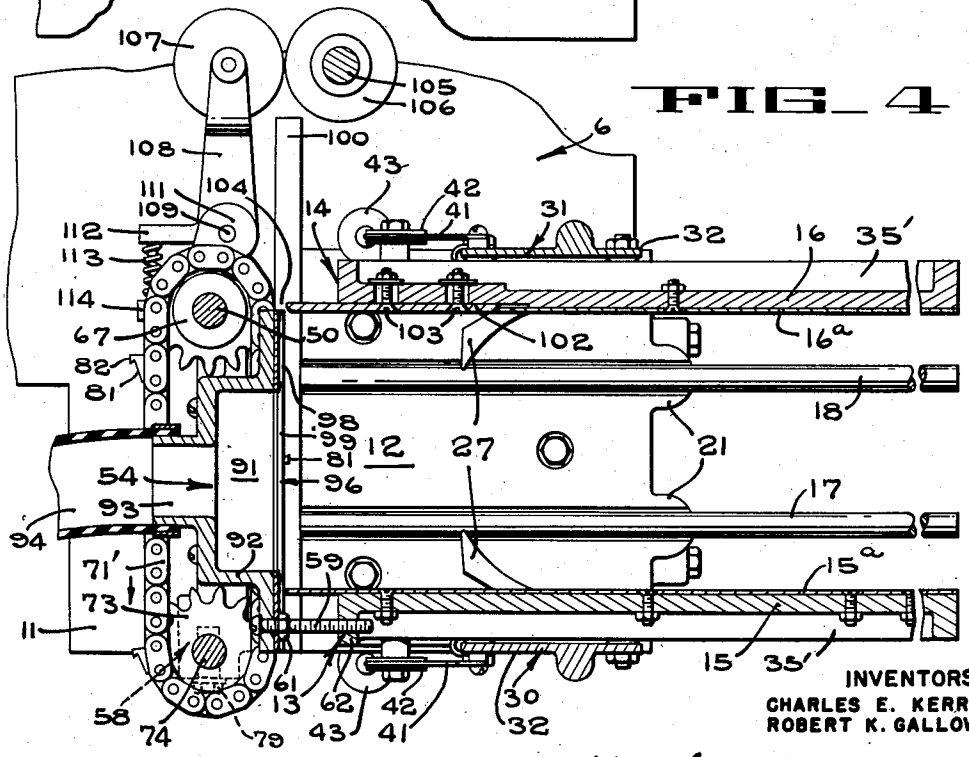


FIG_4



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CARTON STACK ADVANCING MECHANISM

Original Filed Sept. 10, 1951 5 Sheets-Sheet 4

FIG 6

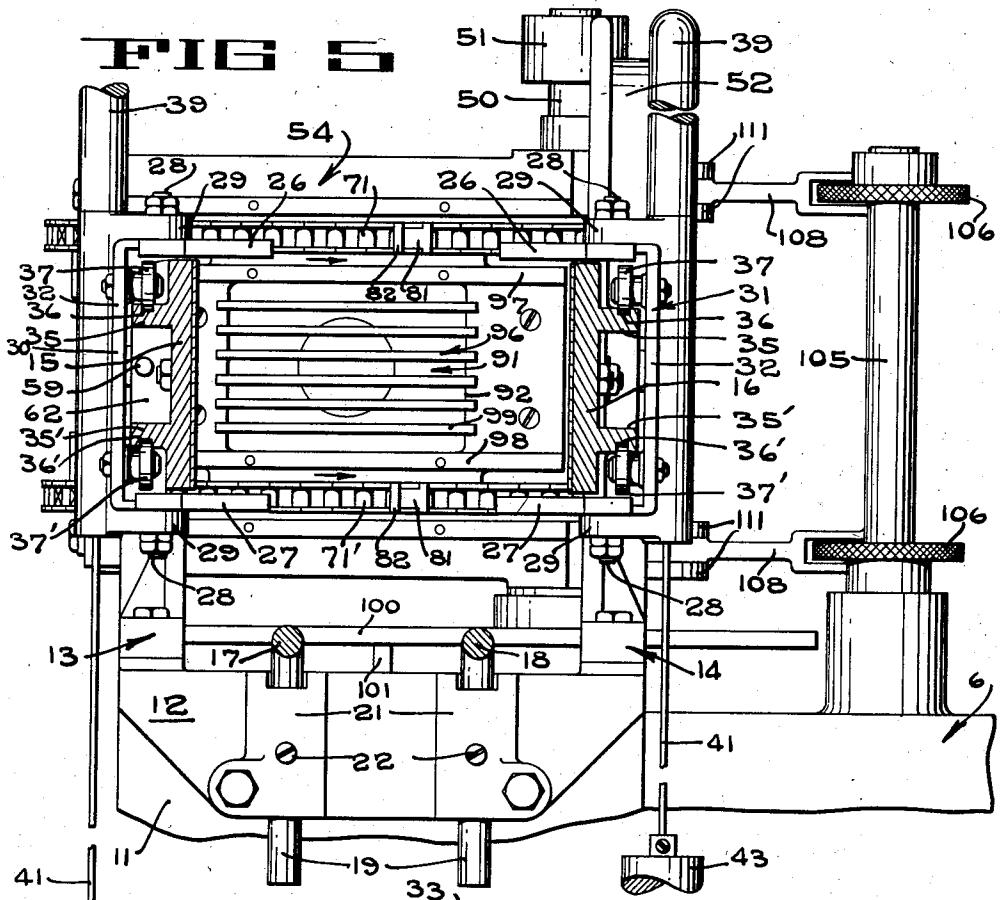
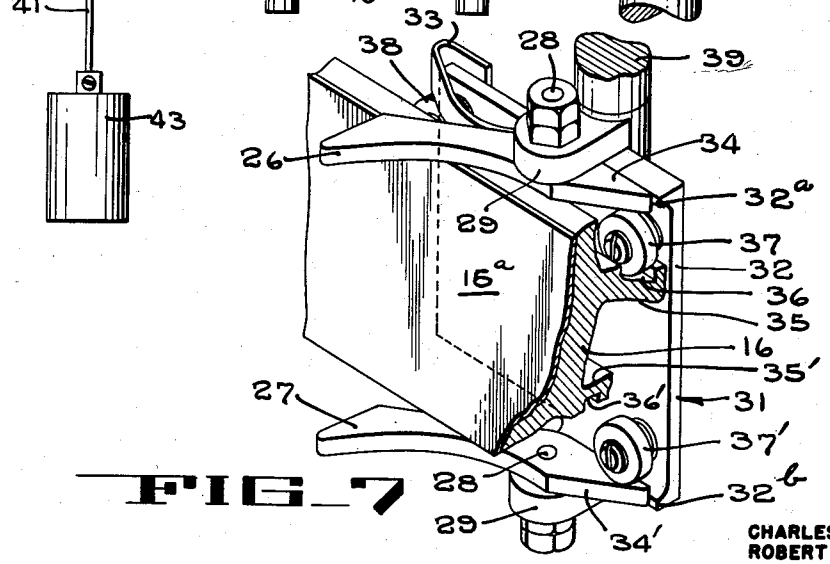


FIG 7



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CARTON STACK ADVANCING MECHANISM

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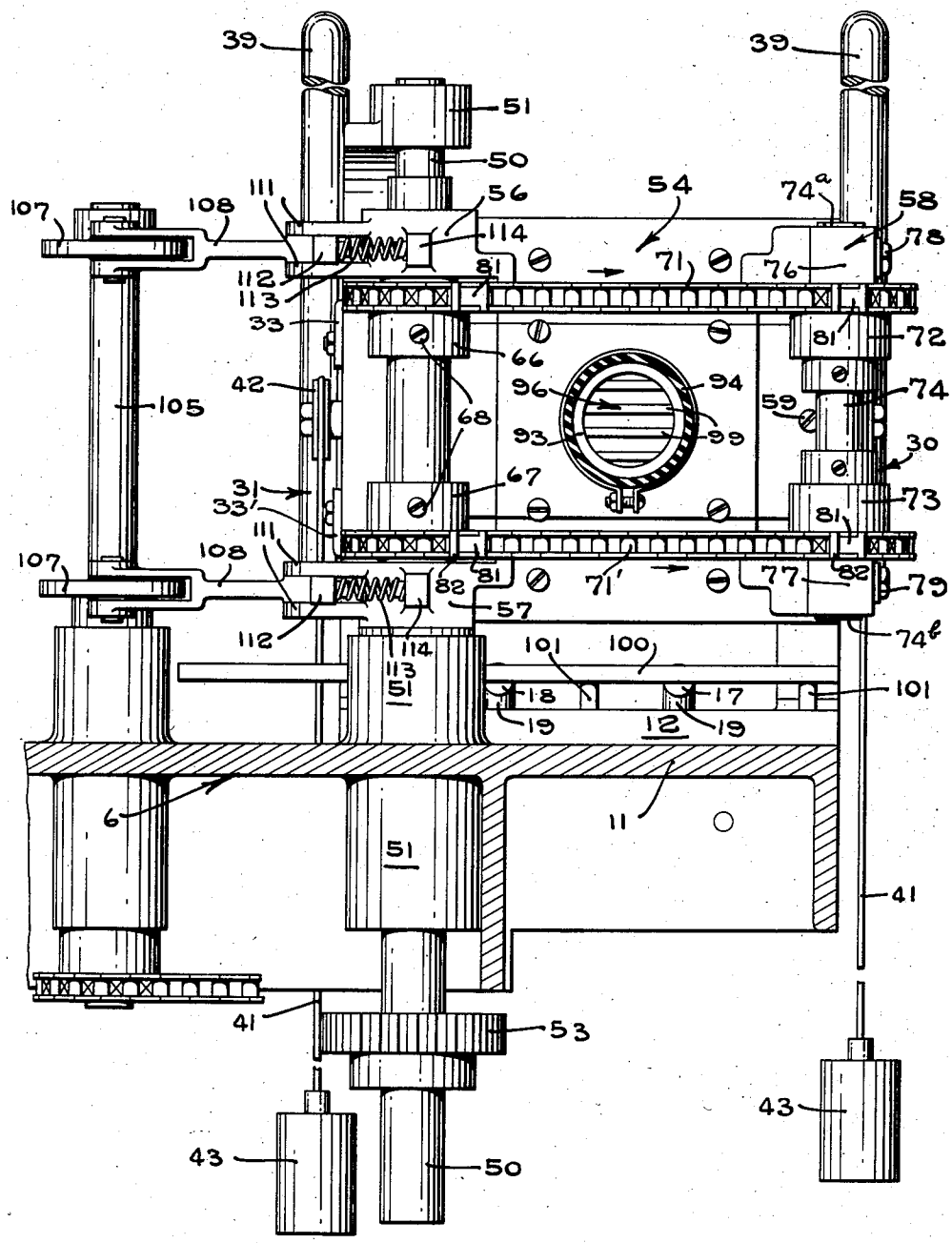

FIG_6

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United States Patent Office 2,840,375
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2,840,375

CARTON STACK ADVANCING MECHANISM

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Original application September 10, 1951, Serial No. 245,778, now Patent No. 2,749,118, dated June 5, 1956. Divided and this application June 22, 1953, Serial No. 363,052

8 Claims. (Cl. 271—62)

The present invention relates to carton stack advancing mechanisms and more particularly to a mechanism especially suitable for effecting continuous advancement of a stack of flat or collapsed cartons to a high speed carton feeding mechanism of the type adaptable for continuous feeding individual cartons to a carton opening, filling and closing machine.

This application is a division of our co-pending application Serial No. 245,778, filed September 10, 1951 for Carton Feeding Device, now Patent No. 2,749,118, dated June 5, 1956.

One object of the invention is to provide a novel and improved type of carton stack advancing mechanism.

Another object is to provide a carton stack advancing mechanism which may be easily and quickly replenished with a fresh supply of collapsed cartons without interfering with or interrupting in any way the continuous advancement of the diminishing stack of collapsed cartons currently in the stack holding magazine fo the mechanism.

Another object is to provide a carton stack advancing mechanism, which readily permits of replenishment of a diminishing stack of collapsed cartons without causing backward toppling of such cartons or loosening of the compacted cartons in said diminishing stack.

Another object is to provide a carton stack advancing mechanism, which is effective to continuously advance a stack of collapsed cartons and concurrently maintain said stack in a uniformly and thoroughly compacted state.

Another object is to provide a carton stack advancing mechanism, which is effective, without pause and in an orderly and proper manner, to automatically advance a stack of collapsed cartons to a carton feeding mechanism for removal thereby of individual cartons from said stack.

Another object is to provide a carton stack advancing mechanism effective to continuously advance, within the stack holding magazine of same, a stack of collapsed cartons, the individual cartons of which may be disposed in various degrees of angularity or obliquity to the axis of said magazine.

Another object is to provide a carton stack advancing mechanism effective to continuously advance a stack of collapsed cartons regardless, within reasonable limits, of the degree of angularity of obliquity assemed by the rearmost carton of said stack relative to the normal axis of the latter.

Another object is to provide a carton stack advancing mechanism employing independently operable stack advancing devices, which may be selectively utilized in alternation or may be utilized jointly to effect advancement of a stack of collapsed cartons within the stack holding magazine of said mechanism and/or which may be selectively retracted in alternation or may be jointly retracted as desired and deemed expedient.

Another object is to provide a novel carton stack advancing device which may be employed with particular advantage and especial effectiveness in and with a carton

stack holding magazine of the horizontally disposed type from which collapsed cartons may be individually removed at a high speed.

Another object is to provide a carton stack advancing mechanism, which may be effectively and efficiently employed with various types of collapsed carton feeding mechanisms of the high speed type.

Other objects and advantages of the present invention will become apparent from the following description and accompanying drawings in which:

Figure 1 is a plan of a carton stack advancing mechanism constructed in accordance with the invention, the associated carton feeding mechanism also being disclosed and parts of the figure being broken away to reduce its size.

Figure 2 is a side elevation of the carton stack advancing mechanism and the associated carton feeding mechanism shown in Figure 1, parts being broken away to reduce the size of the figure.

Figure 3 is a cross section through part of the mechanisms of Figure 2, the planes of section being indicated by the line 3—3 of Figure 1.

Figure 4 is a cross section of part of the mechanisms, the plane of section being indicated by the line 4—4 of Figure 2.

Figure 5 is a cross section, the plane of section being indicated by the line 5—5 of Figure 1.

Figure 6 is a cross section, the plane of section being indicated by the line 6—6 of Figure 1.

Figure 7 is an isometric enlargement, parts being broken away, of one of the carton stack advancing elements.

While the carton stack advancing mechanism of the present invention can be embodied in a number of different ways depending upon the particular kind of carton with which it is to be utilized and depending also upon other variable factors, it has successfully been incorporated in connection with a high speed carton feeding mechanism such as herein shown and described.

In the present instance, the carton stack advancing mechanism is primarily designed for use with cartons which do not necessarily rest in a substantially straight column, yet which must be handled expeditiously and consistently in order to insure of an uninterrupted supply of cartons to a continuously operating carton feeding mechanism. This is primarily for the reason that the carton feeding mechanism with which the carton stack advancing mechanism is utilized operates at sustained high speed.

As shown in Figure 1, the structure includes a general framework 6 supporting a rotating wheel 7 of a carton opening mechanism shown in a co-pending application filed August 21, 1951 with Serial No. 242,951 by Charles E. Kerr, now Patent No. 2,765,715, dated Oct. 9, 1956, said wheel having a plurality of carton holders 8 thereon. The rotation of the wheel 7 is effectuated by any suitable sort of driving mechanism (not shown) which also serves as a source of driving power for the carton feeding mechanism herein shown and described.

The framework 6 has an extension that forms a table 11 serving as a support for the base 12 of a carton magazine frame for the present carton stack advancing mechanism. A pair of upstanding brackets 13 and 14 are removably secured to the magazine base 12. The brackets are elongated to provide side walls 15 and 16, the side walls being in mirror symmetry about a central axis. The side walls extend substantially beyond the table 11 and in general constitute the confining side walls of the carton magazine. They are provided with removable low-friction liners 15a and 16a.

The lower wall of the magazine is in effect formed by a pair of rods 17 and 18, each of which is constructed

with a supporting foot 19 extending through a clamp boss 21 forming part of the magazine base 12 and held in vertically adjusted position therein by a fastener 22. By appropriately setting the brackets 13 and 14 on the magazine base 12 to accommodate the lateral dimension of the carton and by appropriately clamping the feet 19 at an appropriate vertical height to accommodate the vertical dimension, cartons of any size within set limits can readily be held by the magazine. The collapsed cartons are arranged therein with the general plane of each carton in a vertical direction and extending as nearly as may be transversely of the magazine. The bottom edge of the carton rests upon the rods 17 and 18 so that substantially the entire weight of the cartons is borne by said rods. The lateral confinement of the cartons is effectuated by close contact between the side edges of the cartons and the liners 15*a* and 16*a* of the side walls 15 and 16 on the brackets 13 and 14.

The collapsed cartons, due to the extra thickness of their sealing seams tend in stacking to gradually build up on one side, so that each succeeding carton assumes a greater degree of angularity or obliquity to the axis of the carton magazine. Furthermore, as pointed out in our copending application aforementioned, the collapsed cartons, for the reasons given therein, also tend to spring into a concave shape. Therefore, a load for the magazine may not be a strictly rectilinear column but tends rather to become a curved column irregularly spaced and unstable unless confined and specially handled. For the above and other reasons, the carton magazine is provided with a pair of presser pawls 26 and 27 on one side and a similar but independent pair of presser pawls on the other side.

As especially shown in Figure 7, each of the presser pawls such as 26 is appropriately curved and is mounted to swing into and out of the magazine over and under the walls 15 and 16, respectively. The movement is about the axis of a pivot bolt 28 extending through an ear 29 forming part of one of a pair of independent carriages 30 and 31. Since the carriages 30 and 31 on each side of the magazine are images, the description of one applies equally to the other. Each carriage has a generally flat body 32 around one edge of which springs 33 and 33′ are hooked. These springs are arranged to bear against the presser pawls 26 and 27, respectively, to urge them toward the center of the carton magazine. This inward movement of the pawls is stopped by flat extensions 34 and 34′ on the pawls 26 and 27 which abut ribs 32*a* and 32*b*, respectively, on the body 32. The pawls 26 and 27 can be depressed against the urgency of the springs 33 and 33′ out of the space enclosed by the side walls 15 and 16 but normally are projected by said springs into a location in rearward abutment with cartons disposed in the magazine framework.

The carriages 30 and 31 slide or reciprocate on the framework. To that end, each of the side walls 15 and 16 is provided with oppositely directed rails 35 and 35′ defining grooves 36 and 36′, respectively, in which pairs of anti-friction rollers 37, 38 and 37′, 38′ are confined. The rollers are mounted on the body 32 for rotation so that the entire carriage travels to and fro on the side walls in a rectilinear path. Each of the carriages is separately movable either manually by means of an upwardly extending hand grip 39 or may be arranged to be normally urged longitudinally of the framework in the direction of the carton discharge end thereof. For the latter purpose a flexible cable 41 is at one end connected to the body 32 and is trained over a grooved pulley 42 pivotally mounted on the adjacent bracket 13 or 14 as the case may be. At its other end the cable is secured to a weight 43. With this arrangement, either of the carriages with its pair of presser pawls 26 and 27 can be retracted by hand to the extremity of the rails 35 and 35′ and then can be released against cartons put into the magazine, or both of the carriages can be simultaneously actuated by an operator and will press against a carton column even though it is irregular.

In the normal replenishment of the carton magazine, the diminishing stack of collapsed cartons ahead of the presser pawls 26 and 27 is left intact, so that advancement of said stack within the magazine will continue undisturbed. Therefore, the fresh supply of collapsed cartons, in generally columnar arrangement and with the cartons preferably standing on their end flaps, is deposited within the carton magazine behind the inwardly extending presser pawls 26 and 27 and is pushed against the latter while they continue to advance. Then, while the operator holds the new charge of collapsed cartons upright he withdraws one of the carriages, as for example the carriage 30, by grasping the hand grip 39 of same and pulling it sufficiently beyond the rear end of said new charge of collapsed cartons, so that the presser pawls 26 and 27 of said carriage will clear said rear end. As the carriage 30 passes by the new charge of collapsed cartons, the presser pawls 26 and 27 of same are depressed and then spring in again immediately behind the rearmost carton. The retracted carriage 30 is then released to again advance under the urging of its weight 43, to thereby cause its presser pawls 26 and 27 to exert pressure upon and thus compact the entire column of collapsed cartons in the magazine, i. e., the cartons of the diminishing stack plus those of the fresh supply. While the above is taking place, the carriage 31 with its presser pawls 26 and 27 has concurrently continued advancing the diminishing stack in the magazine. Following release of the carriage 30, the operator then grasps the hand grip 39 of the carriage 31 and performs a similar operation with said carriage 31 and its presser pawls 26 and 27, as described above for the carriage 30, which latter with its presser pawls 26 and 27 meanwhile is acting upon the entire column of collapsed cartons in a manner to effect the continuing advancement of said column within the magazine.

Finally both pairs of presser pawls are engaged behind the newly extended carton column and both are effective upon the positioned cartons to urge the entire column in the magazine inwardly of the framework. This action occurs despite the fact that the last carton in the column may not be exactly perpendicular to the axis of the column and even though the cartons may be somewhat bowed and disposed at different distances from the framework on opposite sides. Since the separate pairs of presser pawls can engage immediately with the cartons and follow them as they are fed to the carton feeding device accommodation is made for the possibly irregular shape and disposition of the carton column, also for any angularity or obliquity of the rearmost carton of the column.

From the above described carton replenishing operation, it should be readily apparent that it is unnecessary for the operator to pay any attention whatsoever to the diminishing stack of collapsed cartons, since, such stack is at all times being automatically and continuously advanced in alternation by either the carriage 30 or the carriage 31. Further, it should also be obvious that backward toppling of the collapsed cartons or a loosening of the same in the compacted diminishing stack cannot occur, since, such stack is under compression at all times by either the carriage 30 or the carriage 31.

It is desired to feed the collapsed cartons one at a time from the end of the column inboard of the described framework, but that action is sometimes hampered not only by adhesions between successive folded cartons but also by the curvature or concavity of the cartons which do not readily yield to the customary treatment. For that reason, a special feed arrangement is provided.

As shown in Figure 6, on the framework 6 there is provided a drive shaft 50 having its axis disposed substantially vertically and arranged to revolve in journals 51 formed on a bracket 52 extending from the side wall 16. The shaft 50 is provided with a drive gear 53 suit-

ably arranged to operate in synchronism with the same drive that rotates the wheel 7.

The drive shaft 50 is designed to serve as a mounting for a swing frame 54. Included in the swing frame 54 is a pair of hubs 56 and 57. The swing frame is extended to an outboard fork 58. An adjusting screw 59 having a lock nut 61 not only engages the outboard fork on the swing frame but also engages with a web 62 forming part of the bracket 13. By this arrangement, when the screw 59 is disengaged from the web 62, the swing frame can be rotated about the axis of the shaft 50 toward and away from the bracket 13. These parts can be arranged either in close relationship for normal operation or can be swung apart for inspection or cleaning and the like. Ordinarily, the screw 59 is engaged and is adjusted so that the swing frame is substantially parallel to the transverse plane of the carton magazine and is arranged across the magazine and is in registry with but is slightly separated from one end of the magazine to leave a space therebetween.

Mounted on the drive shaft 50 between the hubs 56 and 57 of the swing frame are sprockets 66 and 67 driven in unison with the drive shaft by set screws 68 engaging the shaft. Parallel conveyor chains 71 and 71' are trained about the sprockets 66 and 67 and are driven thereby. The chains are also trained around sprockets 72 and 73. These are rotatably mounted on a non-rotative shaft 74 having straddle-milled end portions 74*a* and 74*b* seated within bifurcate bearings 76 and 77 formed on the outboard fork 58 of the swing frame. Adjusting devices 78 and 79 carried by the straddle-milled end portions 74*a* and 74*b* serve to effect adjustment of the shaft 74 relative to the outboard fork 58. The arrangement is such that when the drive shaft 50 is revolved, the two chains 71 and 72 are advanced in unison. The adjustments 78 and 79 insure that the chains can be maintained at the proper tension. Since the chain sprockets 66 and 67 are concentric with the mounting of the swing frame, the frame can be moved into and out of operating position without interfering with the drive mechanism.

In accordance with the invention, each of the chains 71 and 71' is provided at an appropriate interval, depending upon the timing arrangement of the mechanism, with one of a plurality of propulsion lugs 81 incorporated in the body of the chain and having a projecting hook 82 especially designed to engage the trailing edge of the leading carton from the column of cartons in the carton magazine. The direction of advance of the chains 71 and 71' is such that the tendency of the lugs 81 is to force a carton from the magazine toward the receiving wheel 7.

Disposed in the swing frame is a vacuum box 91, especially shown in Figures 3 and 4. The vacuum box is preferably defined by rectangularly disposed walls 92 integrally incorporated with the swing frame. The vacuum box walls 92 lead to a tubular connection 93 to which a flexible hose 94 is connected. The hose extends to any suitable source of moderate subatmospheric pressure or vacuum. The extent of the subatmospheric pressure is not particularly great being only sufficient to draw an adjacent carton toward the vacuum box without holding the carton so securely that it cannot be simultaneously advanced by the lugs on the chain mechanism.

It is desired that a carton urged toward the vacuum box be maintained in a planar condition. This is facilitated by the provision on the vacuum box of a grid 96 including a pair of coplanar side rails 97 and 98 extending transversely across the upper and lower end of the magazine in a plane in front of the general structure of the chains 71 and 71', but behind the tops of the hooked lugs 81. Supplementing the rails 97 and 98 in forming the grid 96 are rods 99 spanning one side of the box 91. These help to correct distortion of the container pressed against the grid by the vacuum and by the pairs of pawls 26 and 27 on the carriages 30 and 31 that force the cartons forward due to the effect of the weight 43. This structure provides an arrangement in which the leading or exposed carton, even though displaced and deformed, is flattened against the grid 96 and is consequently properly oriented in a perpendicular plane and in a generally planar shape and configuration, as distinguished from a concave or distorted shape.

To assist in supporting a carton by contact with its lower edge as it approaches and leaves the grid, there is provided on the framework a slide bar 100 mounted substantially coplanar with the rods 17 and 18 on an adjustable support 101. The timing of the chains 71 and 71' is such with respect to the operation of the shaft 50 and with respect to the operation of the adjacent carton receiving wheel 7 that a pair of the hooked lugs 81 engages at an appropriate time with the trailing edge of the carton flattened against the grid and resting on the slide bar 100. As the chains advance, the hooked lugs advance the carton simultaneously overcoming the frictional load caused by the vacuum without undue difficulty. As soon as one end of the advancing carton clears part of the apertures of the grid, there is a corresponding vacuum release of that carton, and the vacuum then becomes effective on the next superposed carton in the carton magazine.

To make sure that only one carton at a time is displaced from the magazine, the space between the bracket 14 and the grid 96 is adjustably defined by a gage plate 102 secured in position by fastenings 103 operating in slots in the bracket 14. The effect of this arrangement is that there can be left an intervening opening or space 104 (Fig. 4) having a dimension just sufficient to pass a carton of the thickness being employed and far too small to permit the passage of more than one carton at a time.

The advancing carton passing through the opening 104 is further guided and propelled pursuant to the invention. For that reason, the framework 6 is provided with an upright spindle 105 carrying a pair of spaced and knurled guide rolls 106. In opposition to the rolls 106 is a pair of rotatable guide rolls 107. Each of the rolls 107 is carried in one of a pair of forked lever arms 108 secured by journal pins 109 to appropriate ears 111 extending from the hubs 56 and 57 of the swing frame.

To provide variable spacing between the rolls 106 and the rolls 107 so as to accommodate minor irregularities in the cartons being advanced, each lever 108 is provided with an extension 112 which bears against one end of a spring 113 that is seated against a projection 114 extending from the swing frame. The shaft 105 with its rollers 106 is constantly driven at a speed that is appropriately related to the operational speed of the carton handling wheel 7 and the effect of the described mechanism is to act as a further guide and driver for the cartons initially advanced by the chains 71 and 71' to carry them individually in succession and an appropriate direction toward the mechanism 7.

By this invention there is afforded a structure the usefulness and advantages of which are manifold. The present novel carton stack advancing mechanism has substantially eliminated all of the difficulties heretofore encountered with prior types of carton stack advancing mechanisms by providing a mechanism, the carton stack holding magazine of which may be easily and quickly replenished with a fresh supply of collapsed cartons without interfering with or interrupting in any way the continued advancement of the diminishing stack of collapsed cartons currently in the magazine. Moreover, such replenishment is effected without causing backward toppling or loosening of the compacted cartons currently in the magazine.

The novel, independently operable, carton stack advancing devices employed in conjunction with the carton stack holding magazine are effective to apply and direct pressure upon the carton stack where required,

to thereby maintain the collapsed cartons in a uniformly and thoroughly compacted state, this while being continuously advanced toward the removal end of the magazine.

These carton stack advancing devices are also effective to distribute pressure over an uneven surface of the stack, and are particularly effective when collapsed cartons having sealing seams are being handled. In stacking this type of carton, the extra thickness of the sealing seam of same gradually builds up on one side of the stack, thereby causing each succeeding collapsed carton to assume an increasing degree of angularity or obliquity to the axis of the carton stack holding magazine. However, regardless of the degree of angularity or obliquity assumed by the collapsed cartons, within reasonable limits, the present stack advancing devices are capable of effectively maintaining the desired and required pressure upon such collapsed carton stack.

Furthermore, the stack advancing device, of the present invention, is particularly advantageous and especially effective when employed in and with a carton stack holding magazine of the horizontally disposed type having a collapsed carton feeding mechanism at the carton removal end thereof effective to individually remove, at high speed, collapsed cartons from said magazine and feed same to a carton opening, filling and closing machine. A further advantageous and beneficial feature of the present carton stack advancing mechanism is that the same may be effectively and efficiently employed with various types of high speed, collapsed carton feeding mechanisms.

While we have illustrated and described a preferred embodiment of the present invention, it should be understood, however, that various changes and modifications may be made in the details thereof without departing from the spirit and scope of the invention as set forth in the appended claims.

Having thus described the invention, what we claim as new and desire to protect by Letters Patent is:

1. A carton stack advancing mechanism comprising a carton magazine having a pair of parallel supports, a pair of carriages, each carriage being mounted on one of said supports independently of the other carriage through substantially the full length of the magazine, presser pawls mounted on said carriages for movement into and out of said magazine and toward and away from each other, and means for urging said carriages individually toward one end of said magazine.

2. A carton stack advancing mechanism comprising a carton magazine having a wall, tracks on the outside of said wall, a carriage movable along said tracks, means for urging said carriage toward one end of said magazine, a pair of vertically spaced presser pawls, means mounting said presser pawls on said carriage for movement into and out of said magazine above and below said wall in substantially horizontal planes, and springs for urging said presser pawls into said magazine, said pawls being arranged to engage the rear-most carton in the magazine at vertically spaced points as said carriage is moved toward said one end of said magazine.

3. A carton stack advancing mechanism comprising a carton magazine having spaced parallel side walls, a carriage slidably mounted upon each of said side walls, presser pawls mounted upon each of said carriages for movement into and out of said magazine and toward and away from each other, and means for urging said carriages individually to slide toward one end of said magazine at least one of said carriages being retractable to a loading position independently of the other carriage.

4. A carton stack advancing mechanism comprising a carton magazine, a carriage slidably mounted upon each side of said magazine, carton advancing means mounted upon each of said carriages for movement into and out of said magazine and toward and away from each other, and means for urging said carriages individually to slide through the entire range of movement thereof toward one end of said magazine.

5. A carton stack advancing mechanism comprising a carton magazine, independently operable stack advancing devices movably mounted upon said magazine and arranged for movement into and out of said magazine toward and away from each other, and means for urging said devices individually toward one end of said magazine, each of said carriages being individually retractable to a loading position.

6. A carton stack advancing mechanism comprising a carton magazine, two stack advancing devices slidably mounted upon said magazine, and means for independently urging each of said devices to slide toward one end of said magazine, at least one of said devices being retractable to magazine-loading condition while the other of said devices remains in stack-advancing condition.

7. A carton stack advancing mechanism comprising a carton magazine having a pair of side walls, a track on the outside of each of said side walls, a carriage movable along each of said tracks, means for urging said carriages toward one end of said magazine, at least one of the carriages being individually retractable to a loading position, carton advancing means mounted upon said carriages for movement into and out of said magazine above and below said side walls, and means for urging said carton advancing means into said magazine.

8. A carton stack advancing mechanism comprising a carton magazine having a side wall, a track on the outside of said wall, a carriage movable along said track, means for urging said carriage toward one end of said magazine, a pair of presser pawls mounted on said carriage, one mounted above and the other mounted below said side wall for movement into and out of said magazine, and means for urging said presser pawls into said magazine.

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