Sept. 9, 1947. R. M. FREEMAN 2,426,993

PACKAGE UNLOADING DEVICE

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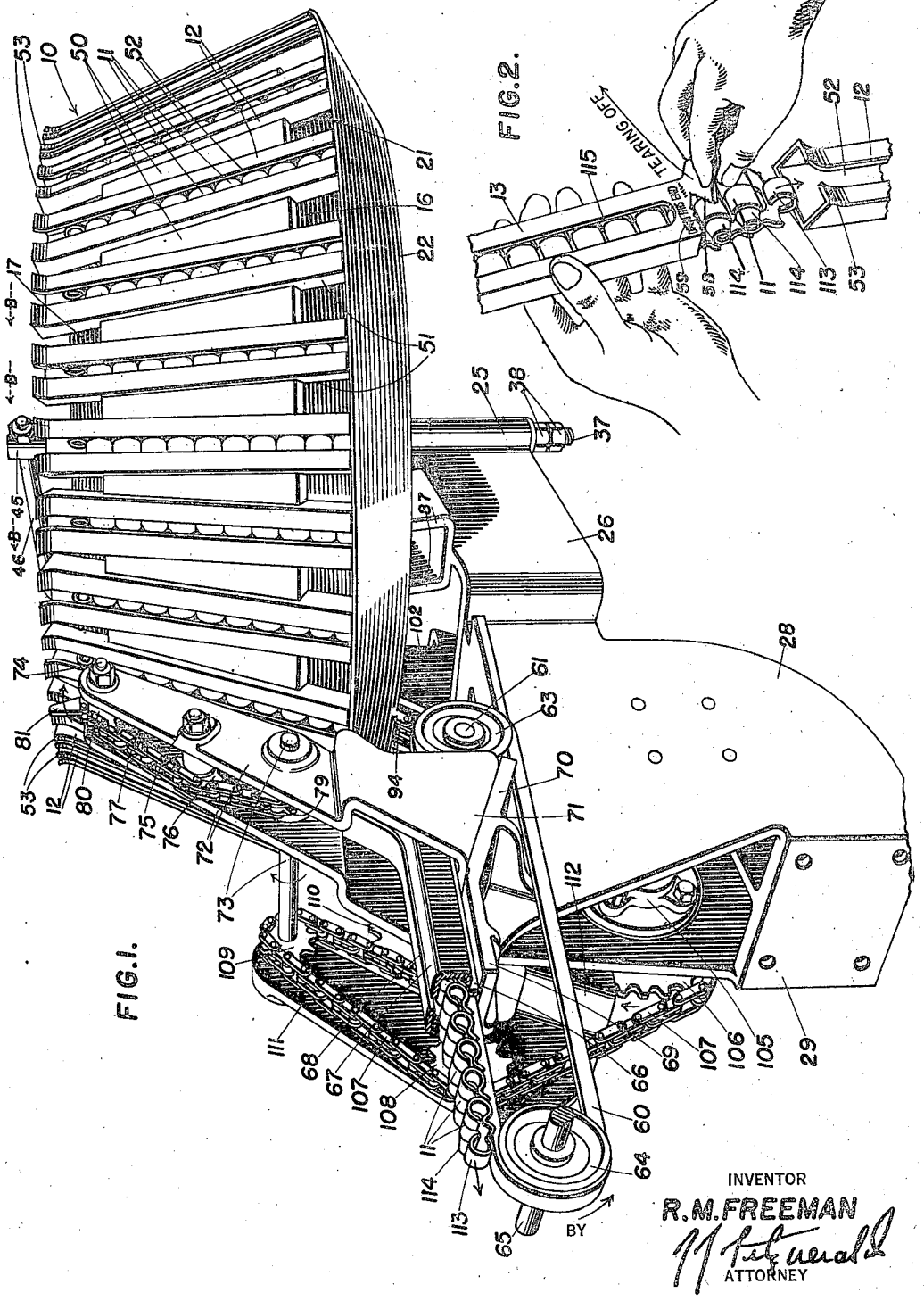


FIG. 1.

FIG. 2.

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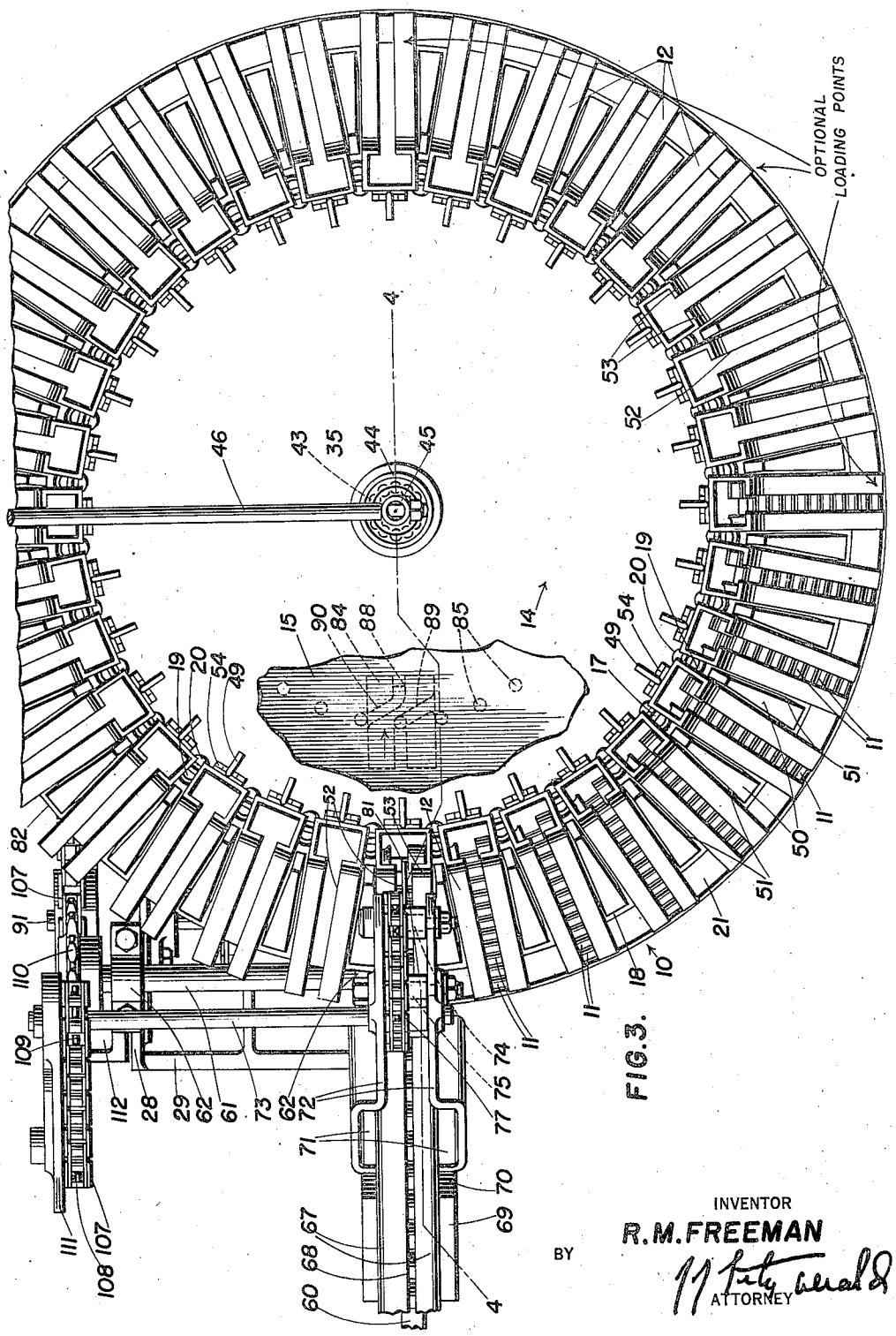


FIG. 3.

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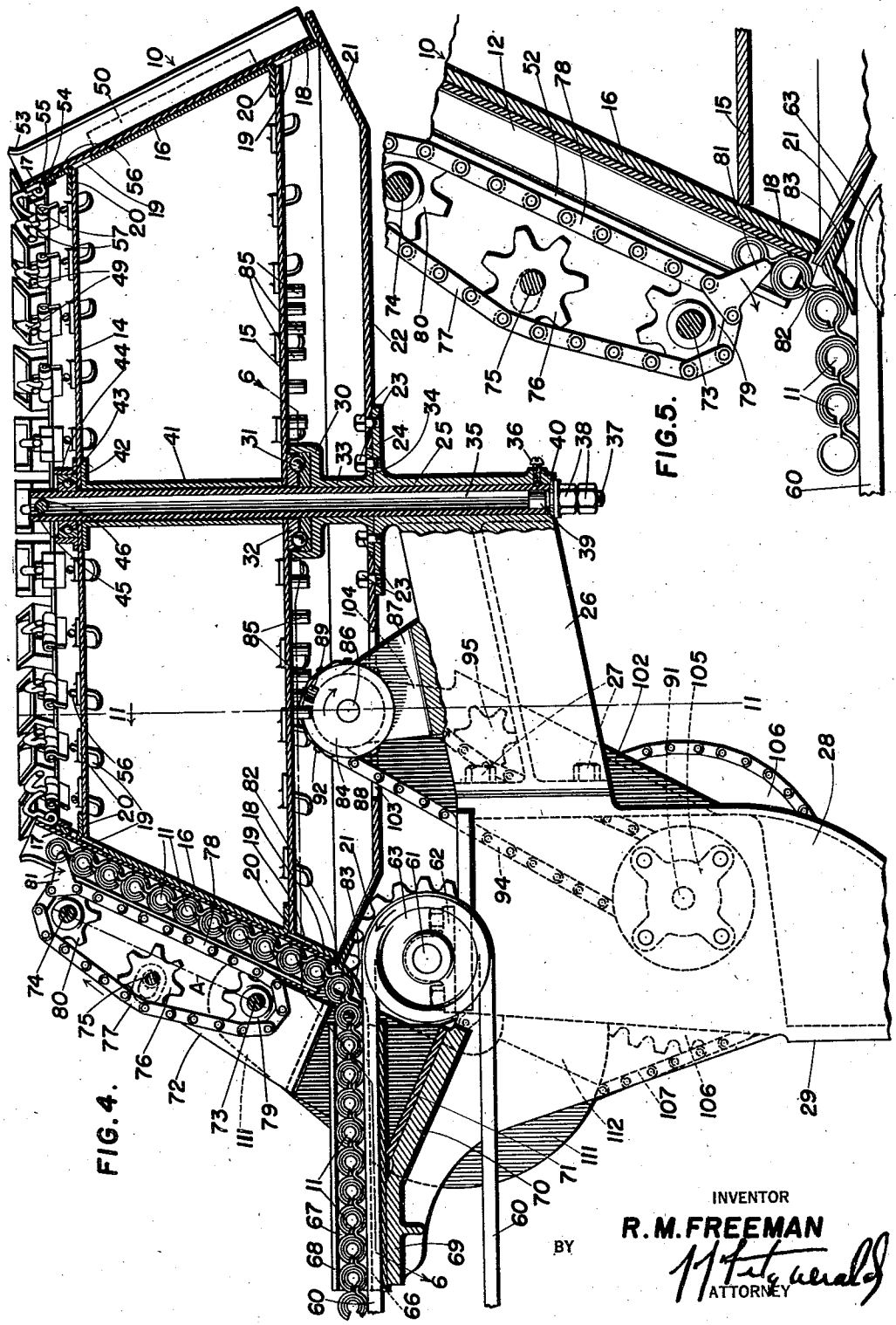


FIG. 4.

FIG. 5.

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PACKAGE UNLOADING DEVICE

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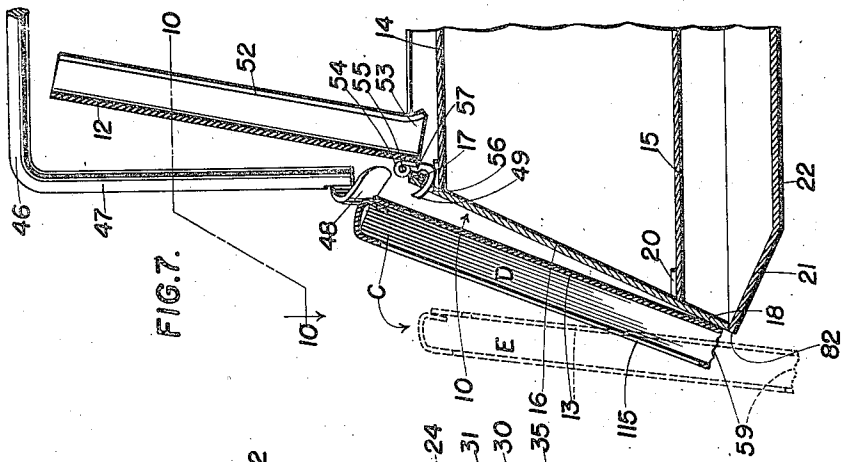


FIG. 7.

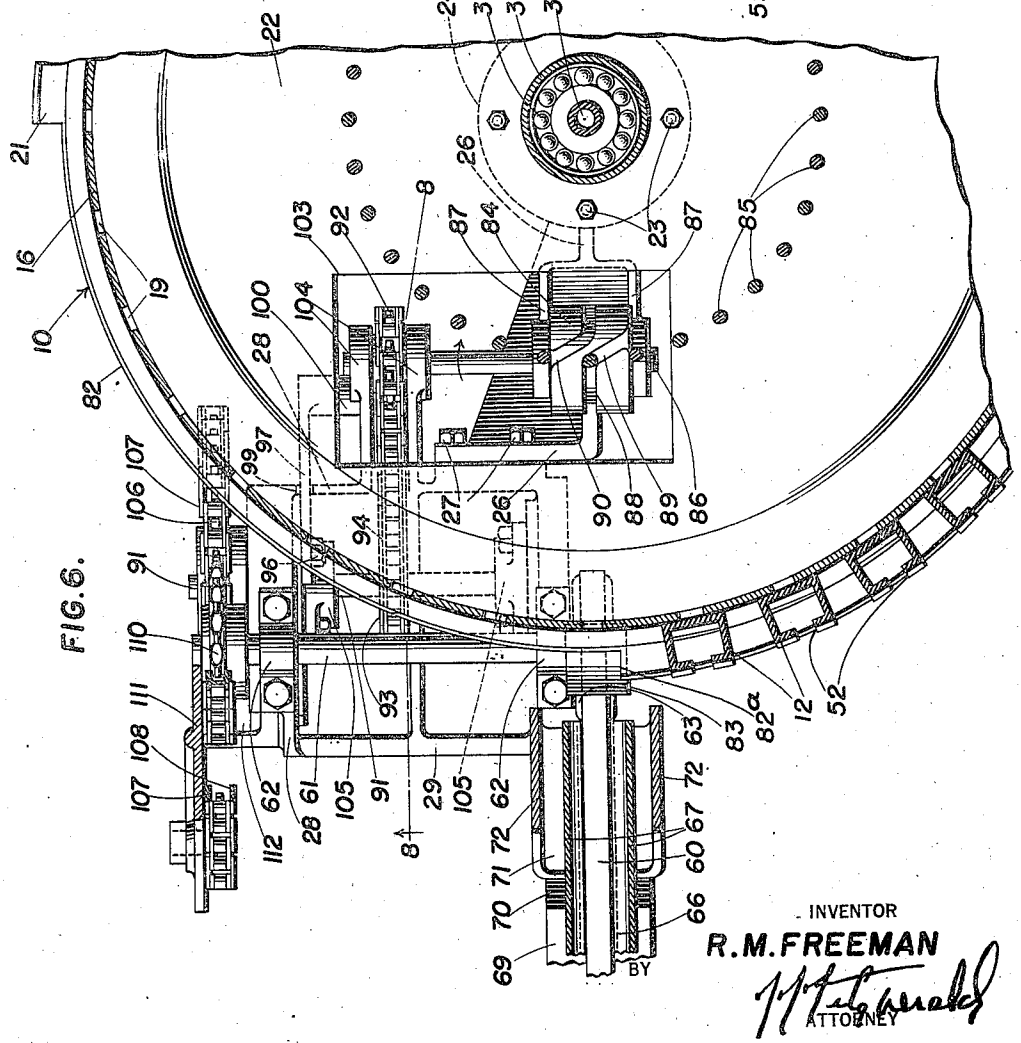


FIG. 6.

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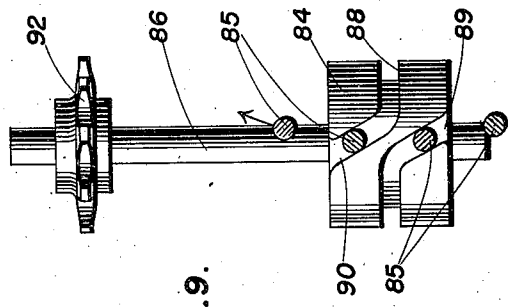


FIG. 9.

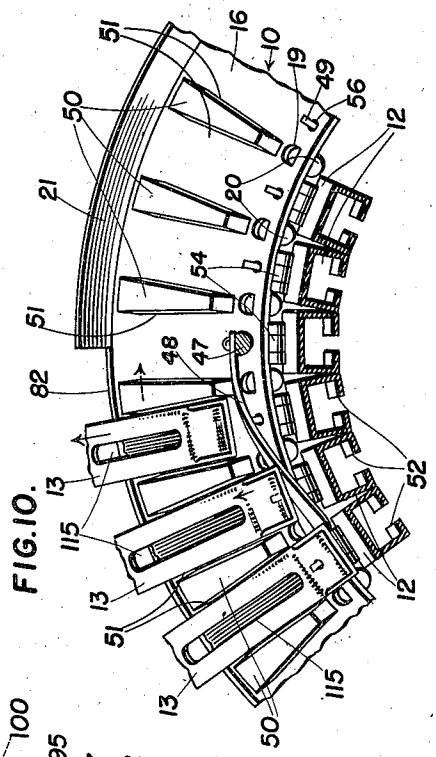


FIG. 10.

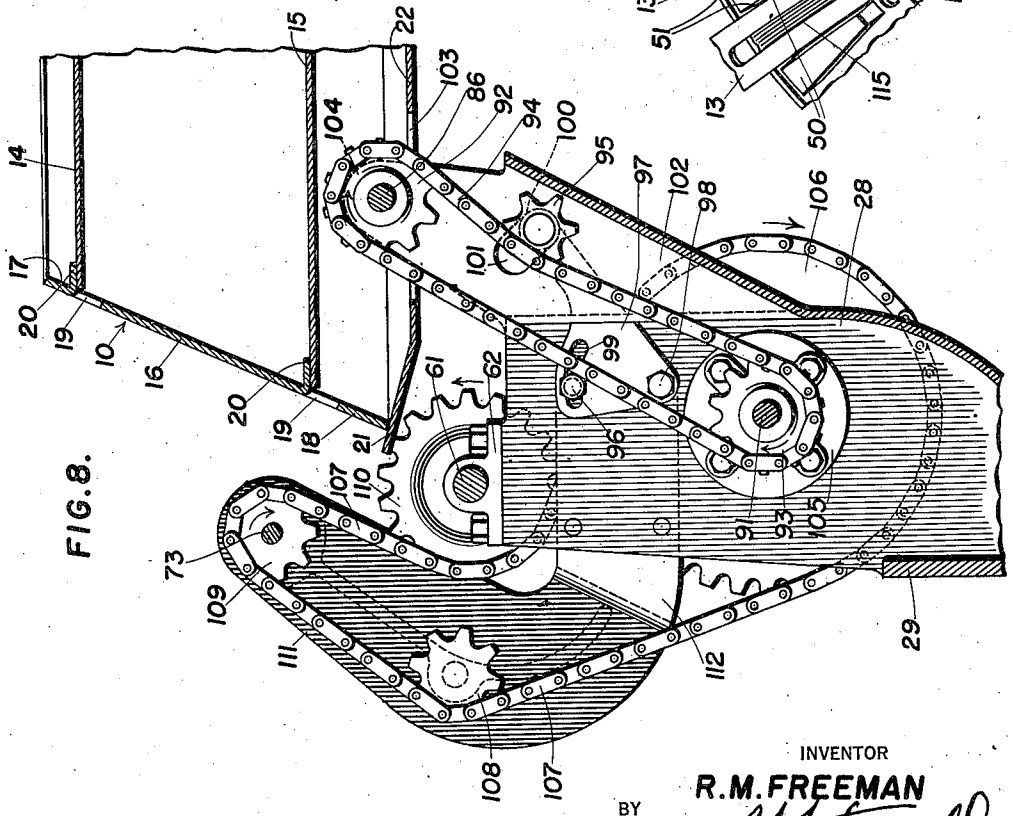


FIG. 8.

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FIG. 12.

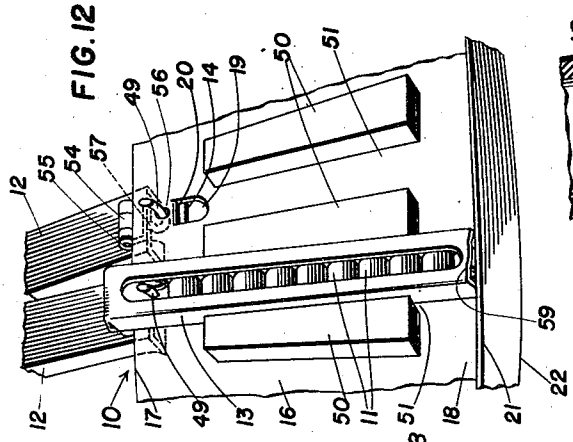


FIG. 13.

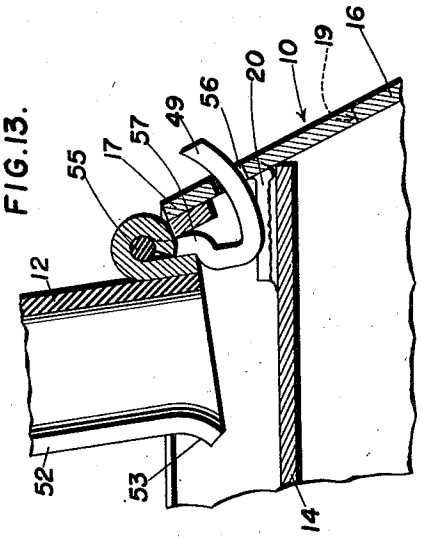
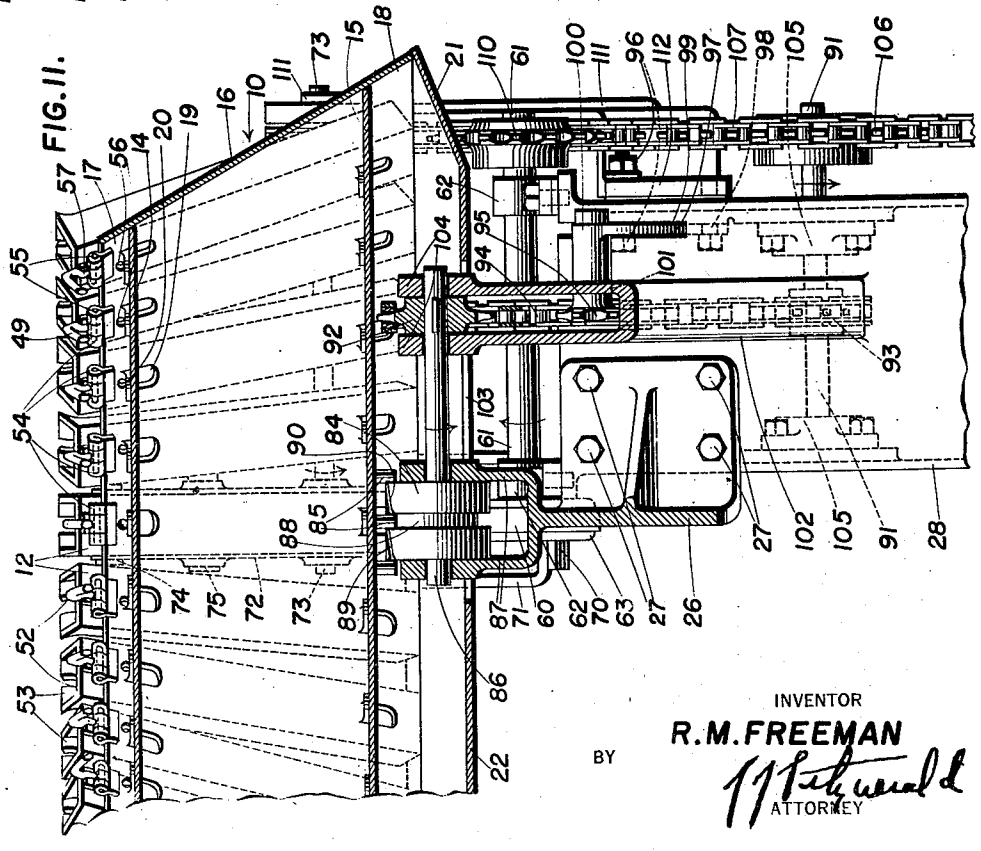


FIG. 11.



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Patented Sept. 9, 1947 2,426,993

UNITED STATES PATENT OFFICE

2,426,993

PACKAGE UNLOADING DEVICE

Robert M. Freeman, United States Navy

Application August 1, 1942, Serial No. 453,209

10 Claims. (Cl. 214—1.1)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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This invention relates to improvements in unloading apparatuses, a specialized but not limited adaptation thereof being to meet the requirements of a high-speed cartridge belting machine such as disclosed in the copending application for patent for Rotary belt loading machine, filed by R. M. Freeman on March 20, 1942, Ser. No. 435,523, now Patent No. 2,413,316. Persons acquainted with the branch of ordnance in which said machine occurs, know that its purpose is to mechanically force succeeding cartridges into the knuckles of a loosely assembled chain of links thereby to connect the latter.

The result of that operation is to construct a belt of cartridges which, in its belt form, is fed into a machine gun for the firing of the cartridges. The rapidity with which the firing is accomplished makes it virtually necessary to employ a machine to belt the cartridges quickly enough to keep the machine gun supplied. In turn, the rapidity of operation of the belting machine makes it impracticable to deliver the links to the belting machine solely by hand, for which reason the instant machine has been devised.

While the machine described herein is entitled "package unloading device," said title should be qualified because in one of its operational aspects it acts solely as a magazine. This aspect occurs when the chutes are used as receptacles into which the links are discharged by hand from the original cartons. As each carton is thus emptied it is thrown aside. The chutes then act as carriers of the links up to the delivery point, and the machine can be kept filled to its capacity as a magazine in a very effective way because a number of persons can be stationed around it to act as loaders. The machine is a magazine in any event, but when the originally full link cartons are hung upon it according to a second operational aspect it then becomes substantially a "package unloading device."

In explanation of the function of said machine, current practice is to put up belt links in cartons. Each carton contains ten links which are loosely coupled, that is to say, are merely fitted together loosely in the carton in readiness for assemblage in chain form when raked out of the chute or carton, in which form the links proceed to the belting machine. It would be inexpedient to deliver the links to the point of use otherwise than in the foregoing assembled form. In order to keep the cartridge belting machine supplied with links at the rate demanded by its speed of operation, use is made of the instant machine in the manner stated. Therefore, one object of this invention is

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to provide a machine which will quickly and systematically deliver succeeding multiples of belt links to the in-feed conveyor of a belting machine.

Another object of the invention is to provide a machine by means of which the gravitational unloading of belt links, usually in multiples of ten, in quick succession is assisted by mechanical operation to place the links onto a moving conveyor functioning as the in-feed for the cartridge belting machine.

Another object of the invention is to provide a machine by means of which belt links, usually in groups of ten, are unloaded onto a moving run of the foregoing in-feed conveyor, either from substantially upright chutes into which the links are loaded by hand from the original cartons or directly from said cartons which, for the latter purpose, are hung substantially uprightly on the machine in potential discharging positions.

Another object of the invention is to provide a machine which is instantly convertible into a magazine of either one of two types of link deliveries; first, by the chute method according to which the links are dumped by hand from the cartons into chutes which thereupon serve as substitutes for the cartons; or, second, by the original carton method according to which said cartons are hung in substantially upright positions in the machine and serve as their own carriers of the links up to the delivery point.

Another object of the invention is to provide a link feeding machine for a cartridge belt loader, the principle of said machine being to transport succeeding multiples of links in substantially upright positions with a step motion to a delivery point.

Still further objects, advantages, and improvements will be apparent from the following description of the invention taken in connection with the accompanying drawings, of which:

Figure 1 is a perspective view of the package unloading machine, showing the chutes in position for containing the links and transporting them to the delivery point.

Figure 2 is a perspective view illustrating the mode of filling the chutes from the original cartons.

Figure 3 is a top plan view of the machine, parts being broken away.

Figure 4 is a vertical cross sectional view taken on the line 4—4 of Fig. 3.

Figure 5 is a detail view partially in section and elevation, illustrating the raking finger action.

Figure 6 is a horizontal sectional view taken on

the line 6—6 of Fig. 4, only a few of the link chutes being shown.

Figure 7 is a detail sectional view illustrating the ejector action when the machine is converted to original carton use.

Figure 8 is a vertical sectional view taken on the line 8—8 of Fig. 6.

Figure 9 is a detail plan and horizontal sectional view illustrating the cam and stud arrangement from which the step motion of the turret is derived.

Figure 10 is a cross sectional view taken substantially on the line 10—10 of Fig. 7, again illustrating the carton ejector action.

Figure 11 is a vertical sectional view taken on the line 11—11 of Fig. 4.

Figure 12 is a detail perspective view of a portion of the turret illustrating its conversion to carrying the original cartons.

Figure 13 is a detail sectional view illustrating the carton hook and link chute.

In carrying out the invention provision is made of a turret, generally designated 10, which comprises the carrier for the belt links 11 whether contained by the annulus of chutes 12, forming parts of the turret, or contained by the original cartons 13 (Fig. 2) when the cartons are hung in place upon the turret (Fig. 12). The carrier is frusto-conical in shape (Fig. 4) thereby enabling the employment of the force of gravity as a partial aid in keeping the chutes 12 or the cartons 13 in place. Said frusto-conical form is derived from making the top plate 14 of a smaller diametral size than the bottom plate 15. When the properly-formed peripheral wall 16 is applied to the edges of said plates, the result is a turret with a downward and outward slope.

The upper and lower margins 17 and 18 of the turret wall 16 project above and below the respective top and bottom plates. Any well-known means may be used to secure the wall 16 to said plates, a convenient mode being to stamp the wall as at 19 (Figs. 8 and 10) at an appropriate number of places, the resulting lugs 20 being bent inwardly and have the plates 14, 15 welded or riveted thereto. The lower margin 18 extends close to the flared rim 21 of a base plate 22 but does not touch so as to avoid interfering with the step motion of the turret.

Said base plate 22 is secured at 23 to the flange 24 of the tubular terminal 25 of a bracket 26. This bracket is bolted at 27 to a housing 28. Said housing includes an upright plate 29 which is equipped with holes (Fig. 1) through which it is adapted to be bolted to the foregoing cartridge belting machine (not shown). The bracket 26 which is thus solidly mounted provides a firm support at its flange 24 for the supporting cup 30 of a vertical thrust bearing 31, the movable race 32 of which is attached (as by welding) to the bottom plate 15. The turret 10 thus turns upon the balls (or rollers) 31. A sleeve 33 which is pendant from the cup 30 has a flange 34 at which the cup is secured to the flange 24.

A stem 35, either hollow as shown (Fig. 4) or solid, is rigidly secured to the terminal 25 in which it fits, by a set screw 36. In the instance of the hollow stem, use is made of a threaded stud 37 to take one or two binding nuts 38, the plug 39 of the stud being sweated in place in the stem. The nuts exert clamping pressure on the closure portion 40 of the terminal 25. A sleeve 41 is rotatably mounted on the upper portion of the stem 35 which stem thus becomes the arbor for the turret. The sleeve 41 spaces the top and bottom plates 14, 15, desirably being secured to each in any appropriate manner.

Said sleeve 41 includes a top flange 42 which aids in supporting a radial thrust bearing 43 and reinforces the top plate where the case 44 of the outer race is mounted. An extension 45 of the stem 35 above the bearing 43 provides the mount for an arm 46. This arm is secured rigidly to said extension from which it projects horizontally (Fig. 7) sufficiently far out to station its upright and downwardly projecting terminal 47 more or less in line with but spaced above the upper turret margin 17.

A cam 48 (Figs. 7 and 10) is carried by the free bottom extremity of the terminal 47. This cam is composed of a strip of material of sufficient rigidity to dislodge the paper cartons 13 from the hooks 49 on which they are impaled (Fig. 12) according to the foregoing second method. Said cam is anchored to the terminal whence it extends with a compound curvature and a radial twist (Fig. 10) oppositely to the direction of turning of the turret. Thus the cam is so positioned as to strip off the empty paper cartons as they are moved around to the discharging position.

Separators 50 as seen in detail in Fig. 12 are distributed equally around the turret 10 to demarcate spaces 51 for either the cartons 13 or the chutes 12. The hooks 49 are centered between the separators. One of the purposes of the latter is to confine the cartons and thereby keep them from canting off to one side under the influence of the dragging action. Each chute 12 comprises a cross-sectionally rectangular tube of metal, one wall of which is slotted at 52 longitudinally from end to end. The slotted walls face outwardly when the chutes are in use, as in Figs. 1 and 3 for example, and face inwardly (Fig. 7) when the chutes are erected to assume idle positions. The ends of each chute are open, that end which becomes the top or entrance when said chute is in use, being flared forwardly at 53 (Fig. 2) to facilitate the introduction of a group of the links 11.

The hook 49 (momentarily describing only one) extends from one leaf and knuckle of a hinge 54 and is struck on an arc, the center of which occurs on the axis of the hinge pin 55. The two leaves of the hinge respectively are secured to the back wall of the chute and to the upper turret margin 17 (Fig. 13). The chute is thus adapted to be swung into either of its intended positions. When in use as in Fig. 1 the back of the chute rests against the sloping turret wall (Fig. 4) between a pair of the separators 50. It then covers a hole 56 in the upper margin 17, from which the hook 49 is retracted by virtue of the position of the chute (Figs. 4 and 11).

When swung to its idle position (Figs. 7, 12 and 13) the chute 12 assumes an inward pitch which is maintained by the binding of the hook shank 57 (Fig. 13) against one of the hinge leaves. Any equivalent support for the chute may be used, but in any case the hook 49 would then extend through the hole 56 in position to have the paper carton impaled thereon. The chute therefore serves the double purpose of containing the belt links 11 when swung down upon the turret and of suspending a paper carton 13 by means of its hook 49 when swung up.

At this point it is desired to explain the foregoing optional use of the chute and carton. In many instances the acceptable performance will

be to tear off the appropriately marked flap 58 as shown in Fig. 2, stand the torn end 59 of the carton upon the rim 21 (Fig. 12) and impale the top-part of the carton on the hook 49 by a firm stroke or push. Since the leverage of the hook 49 is very short as compared with the length of the chute 12, it follows that the point of the hook will puncture the carton paper before sufficient pressure can be exerted on it to swing the substantially erect chute outwardly.

On some occasions, although such are not frequent, the paper cartons will become damp so that their impalement upon the hooks will not be as secure as desired. In such a case the metal chutes 12 will be used in substitution. They are then swung down as seen in Fig. 1. By carefully gauging the position in which the carton 13 is held in one hand in reference to the top of the chute (Fig. 2) and then tearing off the flap 58 the link contents can be discharged very quickly. In fact this mode of use of the machine is preferred to the carton method since it is somewhat faster.

Driving power for the unloading machine is obtained from the cartridge belting machine through a V-belt 60. The right extremity of said belt extends under the turret 10 which latter therefore perimetrically intersects the vertical plane of the top run of the conveyor. The primary purpose of this belt is that of an out-feed conveyor for the belt links 11 (Figs. 1 and 4) from the turret and an in-feed conveyor for said links to the cartridge belting machine. A shaft 61, which serves as the main shaft in so far as the unloading machine is concerned, is journaled in bearings 62 (Fig. 6) mounted on the housing 28. This shaft carries a pulley 63 around which one bight of the belt 60 is trained, the other bight of said belt (Fig. 1) being trained around a matching pulley 64. The pulley 64 is carried by a shaft 65 which is supported in any appropriate way, for example by bearings (not shown) forming parts of the cartridge belting machine.

A consideration to be borne in mind is that the in-feed conveyor 60 is operated at a speed in excess of the link requirements of the belting machine. In other words, the belt 60 tends to feed the links to the belting machine faster than they can be coupled into belt form. The result is that the links are constantly kept up to their work and, moreover, are pushed well into each other so as to avoid lack of registration of the link knuckles. The links are transported by the upper run of the belt. Said run is confined by a guide 66 which is but slightly wider than the belt, said guide being broadened at 67 to accommodate the row of links. The broadened portion of the guide is longitudinally slotted at 68 on top (Figs. 1 and 3) to permit inspection of the row of links and to permit the insertion of a probe in the remote event of a clogging of the passageway.

The guide 66 is fixedly mounted on a shelf 69. This shelf is bracketed off from the housing 28 and includes a sloping portion 70 to which the base 71 of a twin-armed bracket 72 is secured. The arms of said bracket support a drive shaft 73, a companion shaft 74 and the shaft 75 of an idle sprocket 76. The common plane of the axes of the shafts 73 and 74 (line A, Fig. 4) is parallel to the contiguous sloping wall 16 of the turret, thereby establishing the parallelism of the inner run 78 of the chain 77 with said wall.

Said chain is applied to sprockets 79 and 80 on the respective shafts 73 and 74, and to the idler 76. The shaft 75 of the latter is adjustable in slots in the arms of the bracket 72 so as to prevent any appreciable slack in the run 78 of the chain 77. The run 78 is thus kept taut enough to enable successive chutes 12 to move into position thereunder (Figs. 3 and 4) without catching either at the edges of the chain or chutes. This position then constitutes the delivery position of each successive chute, and it is during the pause of the turret at this time that the row of links 11 contained by the chute is raked out.

For this purpose one of the links of the chain 77 is provided with a finger 81 (Figs. 1, 3, 4 and 5) which is registrable with the slot 52 of the chute 12 then in the delivery position. This finger enters the slot at the top (Fig. 4) and in moving downwardly in the chute rakes out the row of links (Fig. 5) onto the belt 60. The rows of links in the successive chutes remain in place in the chutes up to the delivery point, because they ride the rim 21 of the base plate 22 up to said point whereat the rim is perimetrically recessed at 82 to provide a terminal 82a (Fig. 6) and a passageway for the link rows. Said recess is approximately 90° in extent (Fig. 6) in order to provide ample latitude for the ejecting operation in the event the cartons 13 are run through the machine.

In operating the machine according to either the carton or chute method the lowermost link of each row is dragged along the rim 21 until the beginning of the recess 82 is reached. Thereupon the row drops through the recess and is deflected toward the belt 60 by a curved shield 83. This shield is secured to the rim 21 (Figs. 4 and 5) and extends over the belt.

The timing of the operation of the unloading machine is such that the step-motions of the turret are successively deferred until the finger 81 and the last link of the departing row leave the respective slot 52 and chute 12. In other words, the contact of the raking finger with the top of succeeding link rows is synchronized with the pauses between the step-motions of the turret. Said step-motion is produced by the arrangement seen in Fig. 9, consisting of a cam 84 and studs 85. The cam is carried by a shaft 86 which is journaled in a yoke 87 upstanding from the bracket 26. Said shaft underlies the bottom plate 15 from the underside of which the studs 85 project in an annular series to successively meet the cam. The shaft is located tangentially of the stud annulus.

Said cam is peripherally grooved at 88 (Fig. 9). The length of the groove is almost equal to the circumferential distance of the cam and constitutes the well in which each stud is held for the duration of nearly a complete revolution of the cam. The latter has a stud entrance 89 and a stud exit 90, parallel to each other and correspondingly pitched with reference to the axis of the shaft 86. The distance between the confronting faces of the studs is substantially equal to the thickness of the cam block sides which define the radial walls of the groove (Figs. 3, 6 and 11) there being necessary tolerances to insure smooth working.

Driving power for the cam shaft 86 is derived from a countershaft 91 (Fig. 8). For this purpose the respective shafts have sprockets 92 and 93 which are connected by a chain 94. An idler sprocket 95 supports one run of the chain against excess slack by virtue of the adjustabliity of said idler provided at 96 for its carrier arm 97. Said

arm is pivoted at 98 to the housing 28 whence it extends through a slot 99 (Figs. 6 and 11). The idler sprocket shaft bearing 100 at the end of this arm has play in a slot 101 in one side wall of a chain guard 102. The side walls of this guard extend upward through an opening 103 in the base plate 22 where they are surmounted by twin bearings 104 by which the cam shaft 86 is additionally supported.

Bearings 105 secured to the housing 28 support the countershaft 91. One end of this shaft extends a distance outside of the housing 28 (Fig. 11) where it carries a sprocket 106. A chain 107 runs over this sprocket as well as other sprockets 108, 109 and 110 (Fig. 8), the latter of which is carried by the main shaft 61. Said shaft constitutes the driver of the sprocket and chain system of the unloading machine, the driving power being traced to the raking chain 77 by way of its drive shaft 73 which carries the sprocket 109. An arm 111 supports the outer end of the shaft 73 and carries the idler 108. It also provides a partial guard for the chain 107. Its base 112 is mounted on the housing 28, for the securement to which the clamp and pivot bolts 96, 98 of the arm 97 assist.

The operation from the above description will be readily understood. The foregoing so-called chute method is generally preferred because it lends itself to a prevailing tendency on the part of the operators to pick up a carton, tear off the proper flap and dump the link contents into the mouth of the chute. For this purpose all of the chutes 12 are swung down on their hinges 54 into resting positions against the outwardly sloping wall 16 of the turret and between the separators 50 (Figs. 1, 3, 4, 5, 6, and 11). The mouths of the chutes are thus readily accessible to the three (more or less) loaders who stand at conveniently distributed points as indicated in Fig. 3.

There is a preferred way in which the links 11 are packed. The central knuckles 113 should be directed toward that end of the carton marked "Open this end" (Fig. 2) and the constricted knuckles 114 should lie to the left when facing the slot 115 which goes down the front side of the carton. This mode of packaging the links meets the requirement of the foregoing belt loading machine in so far as their position is concerned.

The turret 10 turns with a step motion (arrows B, Fig. 1) in the clockwise direction, looking down. As it does it drags the rows of upended links along the flared rim 21 of the base plate 22 until the recess 82 (Fig. 6) is reached. Thereupon each row drops off of the terminal 82a and onto the trailing end of the preceding link row to add that much to the chain (Fig. 4). The raking finger 81 periodically enters succeeding chutes from the top of the slot 52, making contact with the top link to aid gravity in moving the row down and out.

An accurate spacing of the studs 85 (Fig. 6) which project from the underside of the turret bottom plate 15, insures the stopping of each chute 12 at the identical delivery point. When the cam 84 is not active in advancing the turret one step (Fig. 9), it serves as a positive stop to hold the turret in the discharging position. This is readily understandable from Figs. 3 and 6, each of which shows a pair of the studs riding the opposite flat faces of the cam block while the concentric part 88 of the groove is about to advance upon a stud situated medially of the pair mentioned. In time the medially situated stud is met by the pitched exit 90 of the groove which thereupon exercises its cam action upon said stud and causes the next step of the turret.

For the purpose of unloading links directly from their cartons, the chutes 12 are swung upward and backward (Figs. 12 and 13), leaving the spaces 51 between the separators 50 clear for the cartons 13. The hooks 49 are projected through the holes 56 and beyond the face of the wall 16 when the chutes are swung as stated. The paper cartons are impaled upon these hooks to insure holding them in place while the bottom ones of their link contents are dragged along the rim 21. One flap of each carton is torn off in the same manner pointed out with respect to Fig. 2.

Dumping of the links occurs at the delivery point of the recess 82 (Fig. 6) as before, the finger 81 performing its raking action down the slot 115. But since the cartons remain impaled upon the hooks 49 after they are emptied, use is made of the cam 48 (Fig. 10) to eject said cartons. The principal action is to dislodge the cartons from the hooks (arrow C, Fig. 7) merely by having the tops of the cartons override the cam 48. Since this occurs within the space of the recess 82 the carton is free to fall from its dislodged position D to its falling position E whence it drops either onto the floor or into a receptacle.

While the invention has been described with reference to certain preferred examples thereof which give satisfactory results, it will be understood by those skilled in the art to which the invention pertains, after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is my intention, therefore, to cover in the appended claims all such changes and modifications.

The invention herein described may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A conveyor, an annular support located over the conveyor and having a perimetric recess defining a terminal, said terminal being located contiguously to a movable portion of the conveyor, a turnable magazine having an annulus of evenly spaced article-containing means, said means having open discharge ends situated above said support and spaced closely therefrom, means for operating the magazine with a uniform step-motion, thereby pushing the articles around the annulus and across said terminal, and raking means acting in time with the arrival of succeeding articles at said recess to rake them through the recess and onto the conveyor.

2. A conveyor, an annular support located over the conveyor and having a perimetric recess defining a terminal, said terminal being located contiguously to a movable portion of the conveyor, a turnable magazine having an annulus of evenly spaced article-containing means, said means having open discharge ends situated above said support and spaced closely therefrom, means for operating the magazine with a uniform step-motion, thereby pushing the articles around the annulus and across said terminal, and raking means synchronized with the pauses between the step-motions of the magazine to make raking contact with each article

while traversing the recess, thereby to insure its union with preceding articles on the conveyor.

3. An annulus of evenly spaced containers of articles adapted to be assembled in chain form, a conveyor having a run partially underlying one place at said annulus and being continuously movable in a direction away from said place, means moving the annulus in uniformly timed steps to deposit the articles of succeeding containers upon said conveyor run to progressively lengthen the chain, and continuously moving raker means having at least one finger exercising recurrently continuous pushes upon succeeding articles as deposited.

4. A machine of the character described comprising a turret, conveyor means extending off from contiguity with said turret, means for supporting the turret above the conveyor means a portion of said conveyor means constituting a delivery point for said turret, means for confining rows of links, means for supporting said rows of links gravitationally in upended formation, said supporting means having discharge means in registration with said delivery point, means for turning the turret with a step-motion to transport said rows of links toward said discharge means, and raker means for exerting downward pressure upon the upper end of each upended row of links to assist gravity in moving the links through the discharge means upon the conveyor.

5. A machine of the character described comprising a conveyor having a movable run for supplying a cartridge belting machine with links, a link magazine having a delivery point situated above the movable run of said conveyor, suspension means from which open bottom-ended original cartons of belt links are suspendible in the magazine, supporting means on which the links exposed at the open bottoms of the cartons bear, said supporting means extending up to but stopping short of said delivery point, and means to move the magazine so as to drag the links along the supporting means toward said delivery point.

6. In a machine of the character described, a turnable turret, a stationary rim located marginally of and beneath the turret and having a discharge opening, and hooks on the turret for suspending open bottom-ended original cartons of belt links in positions above the rim to support the exposed bottom links in dragging contact with the rim toward said opening.

7. In a machine of the character described, a turnable turret, a stationary rim located marginally of and beneath the turret and having a discharge opening, hooks on the turret for suspending open bottom-ended original cartons of belt links in positions above the rim to support the exposed bottom links in dragging contact with the rim toward said opening, and separators embodied in the turret, having the hooks substantially centered therebetween said separators serving to confine the cartons against lateral movement.

8. In a machine of the character described, a turnable turret a stationary rim located marginally of and beneath the turret, hooks on the turret for suspending open bottom-ended original cartons of belt links in positions above the rim to support the exposed bottom links in dragging contact with the rim, separators embodied in the turret, having the hooks situated therebetween, and turnable means by which said hooks are carried, said turnable means comprising chutes swingable to retract the hooks and assume positions between the separators in substitution for the hooks.

9. A turnable turret, a continuously operable conveyor having a run underlying the turret, a stationary rim located marginally of the turret between the turret and conveyor, said rim having a recess in registration with said run, hooks on the turret for suspending open bottom-ended cartons upon the turret, said cartons having contents gravitating out of the open ends onto the rim, means to move the turret, thereby to advance the cartons and drag the contents toward said recess, and means for displacing the cartons from the hooks after being emptied of the contents at the recess.

10. A turret having a wall with a hole, a chute hinged to the wall adjacent to the hole, and a hook carried by the chute, being registrable with the hole and moving through it as the chute is swung on its hinge.

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