Aug. 1, 1967 R. W HENSHAW ETAL 3,333,506

SIDE STRIPPING MECHANISM FOR LINKED AMMUNITION

Filed June 7, 1965 2 Sheets-Sheet 1

FIG. 1

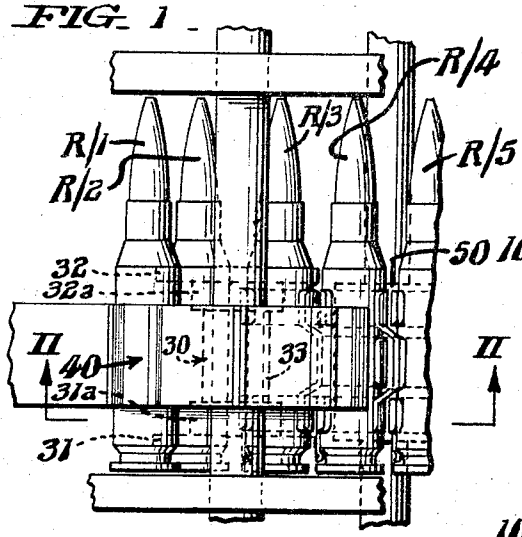


FIG. 4

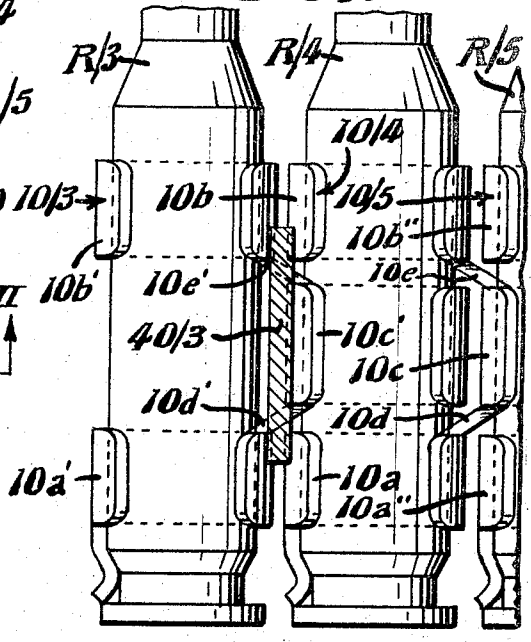


FIG. 2

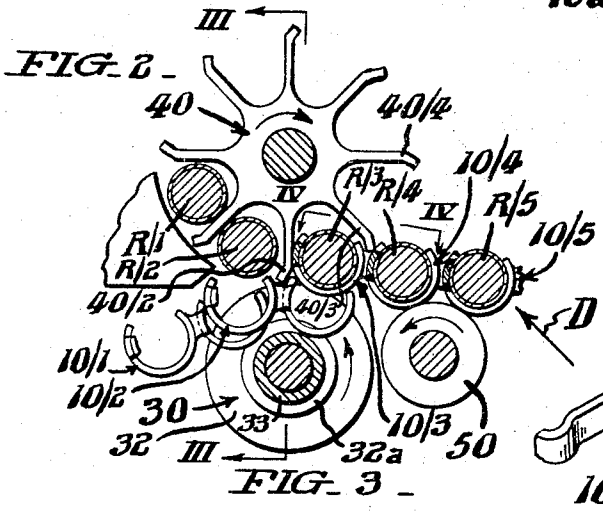


FIG. 3

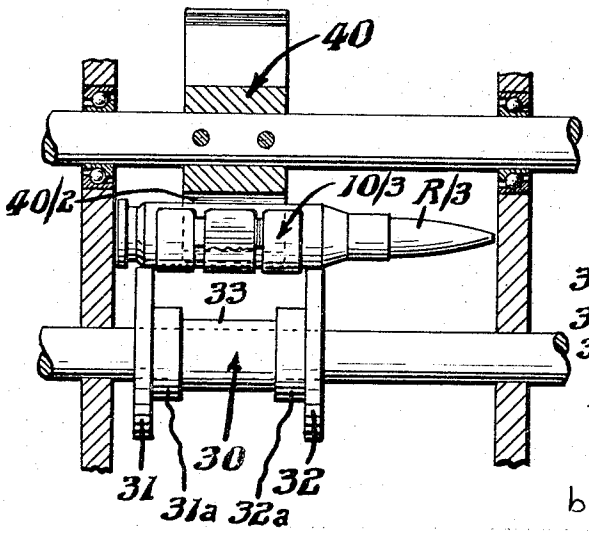


FIG. 6

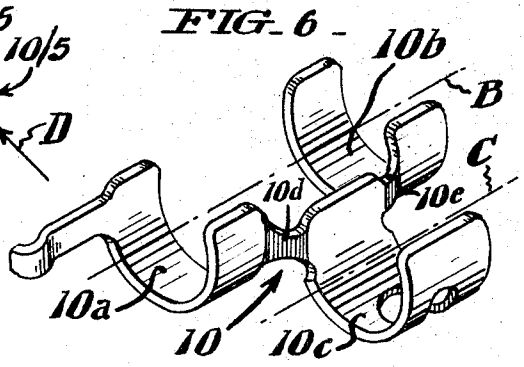
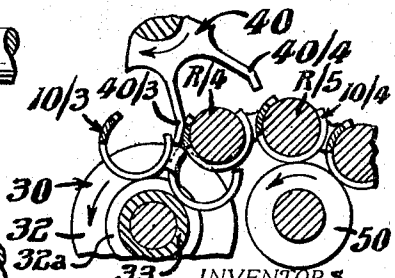


FIG. 5



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SIDE STRIPPING MECHANISM FOR LINKED AMMUNITION

Filed June 7, 1965 2 Sheets-Sheet 2

FIG. 7

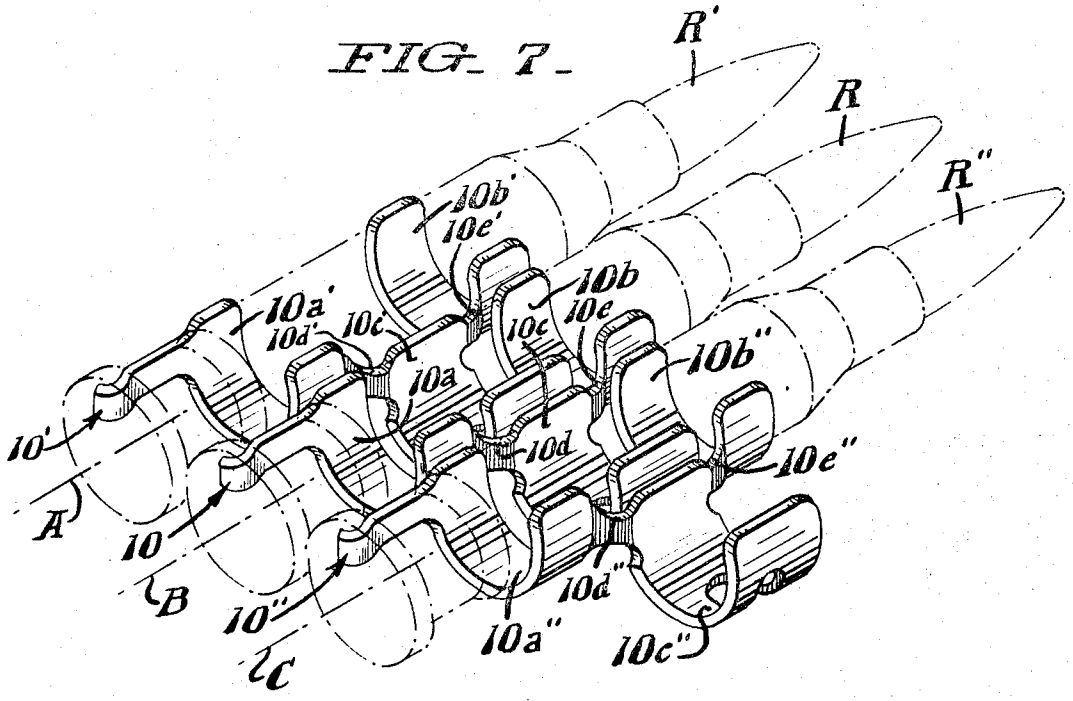
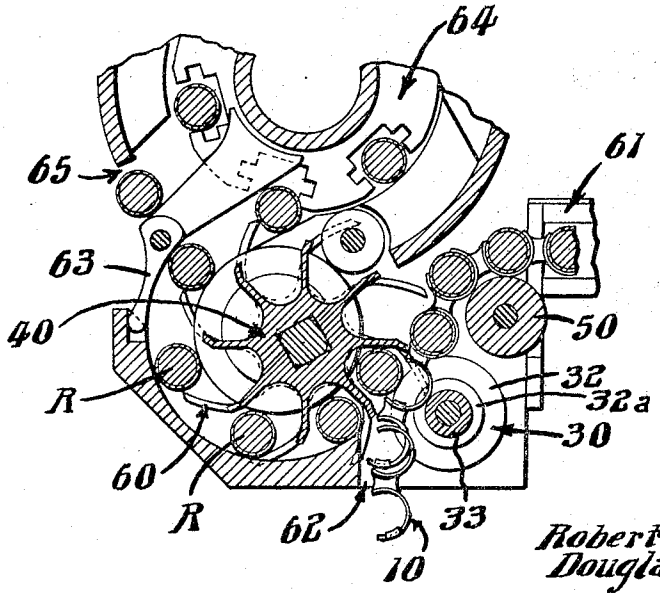


FIG. 8



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SIDE STRIPPING MECHANISM FOR LINKED AMMUNITION

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ABSTRACT OF THE DISCLOSURE

Wide-toothed sprocket and support spool for stripping belted ammunition links from individual rounds passing therebetween, in very high rate of fire automatic weapon system.

This invention relates to ammunition feed mechanisms. More particularly, the invention relates to stripping mechanisms for ammunition feeders or loaders involving linked ammunition.

The invention is particularly adapted for use, for example, in feeders for high-rate-of-fire multi-barrel Gatling-type machine guns. However, the invention may also be used for other purposes, as for example, in mechanized ammunition storage systems employing a linkless feed system.

Conventional cartridge links for 7.62 millimeter and 5.56 millimeter ammunition are designed for end stripping. In end stripping, the link is held and the ammunition round or cartridge is pushed out of the link in the axial direction of the cartridge. This technique is useful and applicable on most conventional weapons which have inherent reciprocating motion.

For extremely high-rate-of-fire multi-barrel Gatling-type weapons, where 10,000 rounds may be fired per minute, rotary motion is prevalent, and the end stripping procedure requires extra mechanism which adds complexity to the apparatus and reduces its reliability.

The object of the present invention is to provide for high-rate-of-fire guns a stripping mechanism which is less complex, more reliable, and substantially less expensive than presently employed stripping mechanisms.

The mechanism provided by the present invention side strips, rather than end strips, the ammunition. That is to say, the mechanism provided by the present invention provides means for driving the link laterally from the cartridge, as distinguished from driving the cartridge axially from the link.

Briefly summarized, the stripping action is accomplished, according to a preferred embodiment of the present invention, by providing, at the stripping station, a freely rotatable support spool positioned on the underside of the ammunition path for supporting the ammunition round (still retained in the link), on the large diameter ends or flanges of the spool. Provided above the ammunition path is a link-stripping sprocket whose teeth or radial arms are long, wide and thin, like paddles. The ammunition belt is a known form of belt formed by rounds linked by a known form of link which has a double-loop forward portion and a single-loop rearward portion. The forward portion is clipped to a preceding round, and the rearward portion is clipped to the following round. The ammunition belt is drawn between the

sprocket and support spool, and when the round has contacted and is supported by the support spool, the tip of one of the radial arms of the stripping sprocket engages a central portion of the link, and as the rotation of the sprocket continues, the movement of the radial arm drives the double-loop portion of the link outward or downward, forcing this portion of the link off the round and onto the hubs of the support spool. The following round now arrives at the flanges of the spool, and with the spool hubs supporting the forward portion of the partially stripped link, as sprocket rotation continues, the single-loop rearward portion of the link is cammed pivotally off the following round. This single loop rearward portion of the link is then received into the area surrounding the core of the support spool, and the completely stripped link is ejected through a suitable exit. The support spool is mounted for free rotation to reduce the drag as the ammunition belt is pulled through the stripping mechanism at maximum speed.

The present invention, summarized above, will be more clearly understood from the following more detailed description of a preferred form selected for illustration in the drawings in which:

FIGURE 1 is a top plan diagrammatic illustration of a stripper mechanism according to the present invention;

FIGURE 2 is a diagrammatic side elevational illustration, partly in section, of the stripper mechanism looking along the line II—II in FIGURE 1 in the direction of the arrows;

FIGURE 3 is a diagrammatic end elevational illustration, in section, looking along the line III—III of FIGURE 2 in the direction of the arrows;

FIGURE 4 is a top plan view looking down along the line IV—IV of FIGURE 2 in the direction of the arrows;

FIGURE 5 is a diagrammatic side elevational illustration, in section, generally similar to a portion of FIGURE 2 showing the condition at the stripping station as the rearward single-loop portion of the link is cammed from the round;

FIGURE 6 is an illustration of a single link of the type employed in the ammunition belt here involved;

FIGURE 7 illustrates the manner in which the links of FIGURE 6 link together successive rounds of ammunition; and

FIGURE 8 is a diagrammatic side elevational illustration showing the relationship of the side stripping mechanism to a high-rate-of-fire gun feeder mechanism.

Referring first to FIGURE 6, which illustrates one of the metal links **10**, it is to be understood that the link **10** is a known type of link which of itself forms no part of the present invention. The stripping mechanism of the invention is designed to side strip this type of link from the ammunition round. It will be seen from FIGURE 6 that the link **10** consists of three C-shaped loops, **10***a*, **10***b* and **10***c*, two of which, namely, loops **10***a* and **10***b*, are co-axial about the common axis B and the third of which, loop **10***c*, is co-axial about the axis C, the axes B and C being parallel to each other. The double loops **10***a* and **10***b* are spaced apart as shown and the space therebetween is adapted to receive the single center loop **10***c*′ of an adjoining link **10**′. This is illustrated in FIGURE 7 which shows three links and three rounds of ammunition. It will be understood that the area on either side of the single center loop **10***c* receives the

spaced-apart double loops **10***a*'' and **10***b*'' of an adjoining link **10**'' which lies on the right side of link **10**, as viewed in FIGURES 6 and 7. It will be seen then that the round R of ammunition which lies along the axis of FIGURES 6 and 7 is clipped by and cradled in three loops, two of which, **10***a* and **10***b*, are the double loops of link **10**, and the third of which, **10***c*', is the single center loop of a preceding adjacent link **10**'. In similar manner, the ammunition round R'' which lies along the following axis C is clipped by and cradled in the center loop **10***c* of link **10** and the spaced-apart double loops **10***a*'' and **10***b*'' of the following link **10**'', all of which is clearly illustrated in FIGURE 7. It will be seen then that with the double loops **10***a* and **10***b* of link **10** clipped to the ammunition round R located on axis B and the center loop **10***c* of link **10** clipped to ammunition round R'' on axis C, the two rounds of ammunition R and R'' are linked together. In this manner the ammunition belt is formed.

FIGURE 2 illustrates diagrammatically the mechanism provided by the present invention for delinking the ammunition belt by side stripping the links **10** from the rounds R. While the stripping mechanism of the present invention is particularly adapted for use in the feeder of high-rate-of-fire guns (such as is illustrated in FIGURE 8 later to be described), the mechanism shown diagrammatically in FIGURE 2 may be used for other purposes, in fact it may be used wherever it is desired to strip the links from the rounds. One example of such other use is in the feeding of rounds into a gun which employs a drum in which linkless rounds are stored in a helix track.

Referring now to FIGURE 2, and also to FIGURES 1 and 3 which are other views of the same mechanism, the ammunition belt formed by the linked rounds R interconnected by links **10** of the type shown in FIGURES 6 and 7 is drawn in the direction indicated by the arrow D through the sprocket **40**. It should be understood that this stripping mechanism will also operate when the single loop of a link enters before the double loop. In being so drawn, the rounds R pass over and are supported by a roller **50** and a spool **30**. Roller **50** and spool **30** are mounted for free rotation, and these elements rotate in the direction indicated by the arrows as the ammunition belt is drawn through the sprocket **40**. In the diagrammatic illustration of FIGURE 2, sprocket **40** may be assumed to be driven positively by means not shown.

FIGURE 3 shows how the ammunition round R is supported by spool **30** while the round R is still cradled in the link **10**. As seen in FIGURE 3, the distance between the inner surfaces of the flanges **31** and **32** of the support spool **30** is made slightly greater than the length of the link **10** so that the spool flanges engage and support the ammunition round R on each side of the link **10**.

Referring again momentarily to FIGURE 6, which illustrates the link **10**, it will be seen that the double loops, such as **10***a* and **10***b*, of link **10** are connected to the single center loop **10***c* by interconnecting strip portions **10***d* and **10***e*, and, as seen most clearly in FIGURE 4, these interconnecting strip portions **10***d* and **10***e* are disposed diagonally relative to the axes B and C of the loop portions of the link.

Returning now to FIGURE 2, this figure depicts five rounds of ammunition R passing through the stripping station. For convenience, the five rounds will be identified as R/**1** through R/**5**, and the links **10** associated therewith will, for convenience, be identified as **10/1** through **10/5**. In FIGURE 2, the first two rounds, R/**1** and R/**2**, have been completely stripped, and links **10/1** and **10/2** of these two rounds are seen to be passing through, or about to pass through, the link ejection exit. The single-loop center portion of the second link **10/2**, which had been clipped around the third round R/**3** has been removed, but the double-loop portions of the third link **10/3** still embrace the third round R/3. Tooth **40/3** of sprocket **40** is about to engage the center portion of the link **10/3**.

This engagement takes place at the interconnecting strip portions of the link corresponding to interconnecting strip portions **10***d* and **10***e* of link **10** in FIGURE 6. This point of engagement is clearly seen in FIGURE 4.

In FIGURE 2, round R/**3** is in contact with the flanges **31** and **32** of spool **30** and accordingly round R/**3** is supported against the downward component of thrust about to be applied to link **10/3** by the tooth **40/3**. The rearward single loop portion of link **10/3** is supported against this thrust by roller **50**. The axial relationship of the teeth of the sprocket **40** to the linked round R/**3** and to the support spool **30** is clearly seen in FIGURE 3.

As the sprocket **40** rotates, the downward thrust of tooth **40/3** drives the forward double-loop portions of link **10/3** from round R/**3**, and the rearward single-loop portion of link **10/3** pivots about round R/**4**. The now delinked forward double-loop portions of link **10/3** soon make contact with and are supported by the hub portions **31***a* and **32***a* of spool **30**, and the next round, round R/**4**, arrives at and is supported by the large diameter flange portions **31** and **32** of the spool. This situation is illustrated in FIGURE 5. As the rotation of sprocket **40** and the downward thrust of tooth **40/3** continues, the single-loop rearward portion of link **10/3** is cammed pivotally from the round R/**4**, and enters the region adjacent core **33** of spool **30**. Link **10/3**, now completely stripped from rounds R/**3** and R/**4**, passes through the link ejection exit. This completes the stripping cycles.

The side stripping mechanism of FIGURES 1–5 described above is adapted for use on the feeder of high-rate-of-fire guns, such for example, as a 5.56 or 7.62 millimeter gun capable of 10,000 shots per minute. FIGURE 8 illustrates the side stripping mechanism incorporated into the feeder of a multi-barrel gun which fires consecutively with individual bolts for each barrel. Thus, while one round is being fired, another is being loaded. The weapon shown in FIGURE 8 has a belt pulling sprocket **60** for pulling the ammunition belt. The axis of rotation of the belt pulling sprocket **60** coincides with the axis of rotation of the stripping sprocket **40**, these sprockets being driven by means not shown. The ammunition belt is pulled by the sprocket **60** through the feed chute **61**, over the roller **50**, over the cartridge support spool **30**, into the radial pockets of the stripping sprocket **40** where stripping takes place as already described hereinabove in connection with FIGURES 1–5. The removed links **10** are ejected through the link ejection exit **62** and the stripped cartridges pass on past clearing gate **63** into the gun rotor **64**. The fired cases are ejected from the exit **65**.

As shown in FIGURE 8, and also in FIGURE 2, the tips of the radial teeth of the stripping sprocket **40** are canted forwardly relative to the radial axis of the remainder of the tooth. This design allows the stripping action to take place without interference between parts. This canting is necessary due to the movement of the cartridges in this weapon design, however, sprocket teeth which are straight will still perform the side stripping function.

A major advantage of the stripping mechanism of the present invention resides in eliminating the complex mechanism heretofore employed, with resultant increase in reliability and reduction of costs. For example, in the high-rate-of-fire 5.56 millimeter multi-barrel gun heretofore referred to, approximately twenty parts (not including the associated mounting hardware, gears, bearings, etc.) can be eliminated by the simplified mechanism of the present invention.

While the preferred embodiment of this invention has been described in some detail, it will be obvious to one skilled in the art that various modifications may be made without departing from the invention as hereinafter claimed.

Having described our invention, we claim:

1. A link stripping mechanism for the feeder of a high-

rate-of-fire gun having a belt pulling sprocket for pulling the ammunition belt, and wherein the ammunition belt is formed by ammunition rounds linked together by links having double-loop forward end portions clipped to a preceding round and a single-loop rearward center portion clipped to a following round, said double-loop and single-loop portions being connected by a pair of spaced-apart interconnecting portions, said link stripping mechanism comprising: a stripping sprocket mounted for rotation above said ammunition belt and having elongated radial teeth the tip portions of which are of sufficient width to engage said pair of interconnecting portions of a link and to impose an outward thrust thereon as said stripping sprocket rotates, and a support spool mounted below said ammunition belt disposed substantially opposite said stripping sprocket for receiving components of force imposed by the teeth of said stripping sprocket, said spool having large-diameter flanges disposed to engage the round at spaced points outside the link clipped thereto and to support the round against the thrust imposed by said sprocket teeth, said spool having smaller-diameter hub portions disposed to be engaged by the double-loop forward portions of a partially stripped link and to receive a portion of the thrust imposed by the sprocket tooth during the time that the single-loop rearward portion of the link is being forced from the succeeding round, another portion of said last-named thrust being received by the large-diameter flanges of said spool supporting the succeeding round, said succeeding round by this time having come into engagement with said flanges of said spool.

2. Apparatus according to claim 1 further characterized in that said spool has a still smaller diameter core, the region surrounding said core receiving the single-loop rearward center portion of a stripped link.

3. In an ammunition handling system wherein an ammunition belt, formed of a plurality of ammunition rounds disposed in parallel relation and linked together by clip links, is moved along a path transverse to the longitudinal axes of the rounds, and wherein each link has a single-loop center portion extending in one lateral direction relative to the axes of the rounds and double-loop end portions extending in the opposite lateral direction, said center and end portions of each link being connected together by interconnecting strip portions, the center portion of one link being disposed between the two end portions of an adjacent link, whereby each round is cradled in a single-loop center portion of one link and in the double-loop end portions of an adjacent link, the improvement of a stripping mechanism for separating the links from the rounds at a stripping station, said stripping mechanism comprising:

support means on one side of said belt for supporting the rounds as they are moved along said path past said stripping station, said support means including a spool mounted for free rotation, said spool having spaced-apart, large-diameter flange portions for engaging and supporting the rounds on either side of the link-engaged portions, and having spaced-apart, smaller-diameter hub portions for engaging and supporting the double-loop portions of a partially stripped link; and

thrust means on the other side of said belt at said stripping station for engaging the links successively at the interconnecting strip portions intermediate adjacent rounds, thereby applying a component of force toward said support means for stripping off the double-loop end portions of a link from one round and the single-loop center portion of the same link from an adjacent round.

4. In an ammunition handling system wherein an ammunition belt, formed of a plurality of ammunition rounds disposed in parallel relation and linked together by clip links, is moved along a path transverse to the longitudinal axes of the rounds, and wherein each link has a single-loop center portion extending in one lateral direction relative to the axes of the rounds and double-loop end portions extending in the opposite lateral direction, said center and end portions of each link being connected together by interconnecting strip portions, the center portion of one link being disposed between the two end portions of an adjacent link, whereby each round is cradled in a single-loop center portion of one link and in the double-loop end portions of an adjacent link, the improvement of a stripping mechanism for separating the links from the rounds at a stripping station, said stripping mechanism comprising:

support means on one side of said belt for supporting the rounds as they are moved along said path past said stripping station, said support means including a spool mounted for free rotation, said spool having spaced-apart, large-diameter flange portions for engaging and supporting the rounds on either side of the link-engaged portions, and having spaced-apart, smaller-diameter hub portions for engaging and supporting the double-loop portions of a partially stripped link; and

thrust means on the other side of said belt at said stripping station for engaging the links successively at a center point intermediate adjacent rounds, said thrust means including a sprocket mounted for rotation on said other side of said path, said sprocket having elongated radial teeth with tip portions sufficiently wide to engage said interconnecting strip portions of said links, thereby applying a component of force toward said support means for stripping off the double-loop end portions of a link from one round and the single-loop center portion of the same link from an adjacent round.

5. In an ammunition handling system wherein an ammunition belt, formed of a plurality of ammunition rounds disposed in parallel relation and linked together by clip links, is moved along a path transverse to the longitudinal axes of the rounds, and wherein each link has a single-loop center portion extending in one lateral direction relative to the axes of the rounds and double-loop end portions extending in the opposite lateral direction, said center and end portions of each link being connected together by interconnecting strip portions, the center portion of one link being disposed between the two end portions of an adjacent link, whereby each round is cradled in a single-loop center portion of one link and in the double-loop end portions of an adjacent link, the improvement of a stripping mechanism for separating the links from the rounds at a stripping station, said stripping mechanism comprising:

support means on one side of said belt for supporting the rounds as they are moved along said path past said stripping station, said support means including,

a spool mounted for free rotation, said spool having spaced-apart, large-diameter flange portions for engaging and supporting the rounds on either side of the link-engaged portions, and having spaced-apart, smaller-diameter hub portions for engaging and supporting the double-loop portions of a partially stripped link, and

a support roller on said one side of said path preceding said spool for supporting a following round and for taking the thrust on the single-loop rearward portion of the link, while the double-loop forward portion is being removed from the preceding round; and

thrust means on the other side of said belt at said stripping station for engaging the links successively at a center point intermediate adjacent rounds, said thrust means including a sprocket mounted for rotation on said other side of said path, said sprocket having elongated radial teeth with tip portions sufficiently wide to engage said interconnecting strip portions of said links, said tip portions being canted forwardly in the direction of rotation of said sprocket, thereby applying a component of force toward said

support means for stripping off the double-loop end portions of a link from one round and the single-loop center portion of the same link from an adjacent round.

References Cited

UNITED STATES PATENTS

2,453,786 11/1948 Dixon ---------- 89—33

FOREIGN PATENTS

584,268 1/1947 Great Britain.

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