This invention generally relates to ammunition storing and feeding devices, and more particularly to such devices for storing and sequentially feeding a plurality of rounds of ammunition to a rapidly firing gun or cannon.

The progressive development of automatic artillery weapons having greater rates of firing ammunition has raised the serious problem of storing a sufficient number of rounds in a compact and yet dependable manner, permitting the feeding of these rounds in sequence to the gun at a great enough speed to satisfy the voracious appetite of the gun without interruptions or delay in the firing rate, jamming of the rounds together or in the gun, misfiring, and other difficulties and/or damage.

Hereinafter, individual rounds or the beads of ammunition are formed on separate links that are joined in sequence to form a continuous flexible articulated belt; and these rounds have been stored by suitably coiling, folding, or stacking this belt transversely, spirally, or concentrically upon itself in layers at rest within a suitable container. With this arrangement, the individual rounds have been fed in sequence to the gun by "unpeeling" or drawing out this belt from the container in a single continuous strand; gradually unwinding the belt portion-by-portion, or lifting it layer-by-layer from its stacked or folded-over arrangement, and thereafter feeding this strand continuously through the gun-firing mechanism. However, since this belt has been folded or coiled in superposed layers with all layers thereof at rest except the layer being unpeeled or unwound from the others, friction results from the individual rounds in the moving layer sliding over the rounds in the layer beneath that is at rest. Furthermore, a minute misalignment of one round of ammunition in the moving layer may readily result in its becoming lodged in the link joint of an adjacent layer or intermediate rounds of an adjacent layer as the belt is rapidly unwound or subjected to shock and vibration. Additionally, since all rounds are at rest within a container until the strand of the belt carrying such rounds is drawn out of the container, the individual rounds are greatly accelerated from a state of rest to a state of sufficiently high velocity necessary to feed the rapidly firing gun; and this acceleration takes place within both a short time and within a narrow space, requiring a virtually tremendous pull on the belt that becomes highly magnified by the rapid rate of gun-fire demanded by present-day weapons.

All of these factors severely limit the usefulness of prior ammunition feeding devices when employed with the progressively improved high firing rate weapons.

To overcome these disadvantages in accordance with the present invention, there is provided a means for compactly winding an elongate ammunition-carrying belt upon itself and thereafter unwinding this belt in such a manner as to prevent any sliding or jamming of the rounds of ammunition in one layer with those of another. Furthermore to eliminate accelerating the rounds from a rest position to the feeding speed as in prior devices the present invention incorporates means for constantly driving the complete belt at a variable constant speed and thereafter feeding the individual rounds to the gun at the same speed by merely changing the direction of belt motion.

It is accordingly one object of the present invention to provide a mechanism for compactly storing and for more rapidly and reliably feeding ammunition to a rapid-firing weapon.

Other objects and many attendant advantages of this invention will be more readily comprehended by those skilled in this art upon a detailed consideration of the following specification taken with the accompanying drawings, wherein:

Fig. 1 is a perspective view illustrating one preferred embodiment of the present invention.

Fig. 2 is a sectional view in side elevation through line 2—2 of Fig. 3, and

Fig. 3 is a section in plan view through line 3—3 of Fig. 2.

Referring now to Figs. 1, 2 and 3 taken together for a detailed consideration of one preferred ammunition storing and feeding means in accordance with the present invention, there is shown a horizontally arranged base plate 10 (Fig. 2) having a substantially circular periphery and having a substantially planar upper surface, that may be ribbed, as desired, upon which is vertically fastened a vertically upstanding cylindrical core member 11. Supported upon this base plate 10 and spirally wound in superposed layers about the upstanding core member 11 as a center is a continuous flexible ammunition belt 12 (Fig. 1), preferably comprised of articulated individual links 13 joined together by a pivotable connection 14, and each carrying a single round of ammunition 15.

Spirally fastened about and along the outer cylindrical surface of this upstanding core member 11 is a continuous outstanding ledge or flange 16 (Fig. 1) which serves as a guide upon which the projectile noses 17 of the rounds 15 rest as they are wound in spiral layers about the central core 11. As shown, each of these spirally-wound coils of ledge 16 is uniformly spaced apart a distance slightly greater than the spacing between superposed layers of the rounds, thereby tilting each of the projectile noses slightly upwardly and preventing jamming or engagement of any one projectile nose intermediate adjoining projectiles in an upper or lower layer.

In accordance with the present invention, the complete ammunition belt 12 together with all the rounds of ammunition 15 connected thereto are rotatably driven at a variably controllable constant speed by rotatably mounting the base plate 10 and its connected central cylindrical core member 11 together on suitable bearings 18 (Fig. 2) preferably about an upright frame member generally designated 19. As shown, this frame member may be comprised of two welded or otherwise affixed structural plates connected at right angles for strength and rigidity and additionally supported at the top and elsewhere by connecting pin shaped segments. Frame member 19 is supported in a vertical position on a fixed base support 20 and is coaxially positioned to vertically project through a central opening 21 in the base plate 10 and concentrically extend into the hollow interior of core member 11, all as best shown by Fig. 2. By rotating the base plate...
3. 0 and its associated core 11 about the vertical axis 22
common to both this core member 11 and the inner cylin-
drical fixed frame member 19, there is provided a hori-
zontally arranged worm gear wheel 23 (Figs. 2 and 3)
preferably positioned beneath and parallel to the base
plate 10 to revolve about the same vertical axis 22 and
being suitably connected to the base plate 10 by means
of a hollow shaft 24 (Fig. 2) or the like. As best shown
by Fig. 3, a worm gear 25, suitably mounted upon a
shaft 26, is provided with gear teeth that mesh with the
teeth of worm wheel 23 and, upon the shaft 28 being
driven by a motor (not shown), the entire inner assembly
including the horizontal base and 10, its connected
vertical cylindrical core member 11, and all the rounds
of ammunition mounted upon belt 12, are rotated about
the central axis 22.

For unwinding the coils of the rotating ammunition
belt 12 and feeding the rounds of ammunition in sequence
to a gun (not shown), there is provided a hollow feed
chute 27 (Fig. 1), preferably rectangular in cross-section
as shown, which is mounted for reciprocating movement
along a vertical axis parallel to and spaced from the ver-
tical axis 22 passing through the center of rotatable cylin-
drical hollow core member 11. As best shown by Fig. 1,
one edge of said rectangularly shaped chute 27 is preferably positioned adjacent the outer peripheral
surface of cylindrical core member 11 and the geometric
plane defined by this mouth is substantially radial to this
surface to face in substantially the same direction as
defined by the radially facing ammunition rounds 15 mov-
ing with the rotating core member 11. Thus, as the
cylindrical core member 11 rotates, the end of the mov-
ing ammunition belt 12 enters the mouth of feed chute
27 and passes through the chute conveying each of the
ammunition rounds on this moving belt through chute 27
in continuous order to be ultimately conveyed to the gun
(for example).

Chute 27 is suitably affixed to a carriage member 29,
preferably of substantially "U"-shape in cross-section as
shown in Fig. 1, which is adapted to ride up and down
along the vertically positioned railing member 30, pref-
erably of substantially T-shaped cross-section, one end
of which is rigidly affixed to the fixed base support 28.
Although not shown by the drawings, this carriage 29 is
preferably driven downwardly along railing 30 in syn-
cronism with each rotation of the cylindrical core mem-
er 11, whereby feed chute 27 is continuously moved
downwardly along the railing 30 in substantial alignment
with each of the spiral guide ribs 16 and is suitably
position to suitably receive the rounds 15 on each coil
of the spirally wound ammunition belt and transmit these
rounds in continuous order to the gun. Means for syn-
cronously driving this carriage 29 and chute 27 may
take the form of an arm 29a of carriage 29 carrying a
suitable roller (not shown) on its end which rides on the
spiral coils 16 to drive the carriage upwardly and down-
wardly or may take the form of rack-and-pinion gears,
with the carriage 29 being affixed to a rack gear and the
pinion gear being driven by the same motor (not shown)
that drives shaft 26 and rotates the ammunition support-
ing means. Other means for synchronously driving feed
chute 27 may take the form of cable-and-pulley means
being driven by this motor; however, since these means
and others are well known to those skilled in the art,
further elaboration of this structure is believed unneces-
sary.

It is to be particularly noted that the present invention
provides a means for driving the complete ammunition
belt and cartridges at a constant controllable speed, and
for feeding this belt in a single continuous strand, moving
at the same speed, to the gun. Thus, the belt and the in-
dividual rounds are not subjected to any rapid acceler-
ation from a rest condition to the velocity necessary for
feeding a rapid-firing gun, as in the prior art devices, nor
vibration and shock; all of which may result in tension
and breaking of the belt links, or displacement of the
individual cartridges on the belt, causing jamming or the
like. Furthermore, it is observed that the individual
rounds do not slide over one another as they are con-
veyed from storage to the feed chute 27, since all rounds
continue to move at the same speed and the rounds being
driven out through the feed chute 27 merely change the
direction of motion. This feature considerably reduces
sliding friction of one round over another and addition-
ally eliminates the hazard of fouling of the ammunition
belt windings together or jamming of the rounds of one
coil with another. It is apparent that the speed of feeding
these rounds may be varied over a wide range to conform with the desired rate of gun fire
by merely changing the drive motor speed, and, in addi-
tion, the same storing and feeding arrangement may be
employed with guns having different firing rates. More-
over, it is apparent that large quantities of ammunition
may be stored in a relatively compact arrangement and
the reserve ammunition remaining after each "burst" or
firing of the gun may be readily determined by merely
observing the number of belt coils remaining about the
cylindrical core member 11.

It is also of interest to point out that by merely reversing the
direction of motor rotation and thereby reversing the direction
of rotation of the base plate 10 and cylindrical core
member 11, the ammunition belt may be entered into the
storing means by spirally winding the belt about the
cylindrical core member 11 in a continuous strand. In
other words, merely reversing the action discussed above
and feeding in the ammunition belt 12 to form spiral loops
about core 11 rather than feeding it out. These and many
other advantageous features, such as storing varying
amounts of ammunition and utilizing a minimum of
ammunition handling in the storing and feeding of ammuni-
tion are peculiar to the present invention and will be
readily recognized by those skilled in the art.

Consequently, although but one preferred embodiment of
the invention has been illustrated and described, it is
obvious that those skilled in the art may make many
variations in carrying out the present invention in accord-
ance with the teaching herein and, therefore, it is intended
that this invention be limited only in accordance with the
following claims appended hereto.

What we claim as new and desire to obtain by Letters Patent in the United States is:

1. In an apparatus for storing and feeding a continuous
belt carrying rounds of ammunition to a rapid-fire gun,
a supporting mechanism for retaining said belt in super-
posed spiraled layers about a common axis, means re-
 sponsive to said power source for counterclockwise
supporting mechanism at an adjustable constant speed
and thereby rotating said spiral layer of said belt at the
same speed, and means responsive to said power source
for changing the direction of movement of a continu-
ous strand of said rotating belt at the same speed to said
gun and thereby unwinding the spiraled layers of the belt
at that constant speed.

2. In an apparatus for storing and feeding a continuous
belt carrying rounds of ammunition to a rapid-fire gun,
a supporting mechanism for retaining said belt in super-
posed spiral layers about a common axis, means re-
 sponsive to said power source for counterclockwise
supporting mechanism at an adjustable constant speed and thereby
rotating all rounds of ammunition at the same speed,
and means for changing the direction of movement of a
continuous strand of said rotating belt and conveying
said strand continuously to said gun thereby unwinding
the spiral layers of the belt at said same speed.

3. In an apparatus for storing and feeding a continuous
belt carrying rounds of ammunition to a rapid-fire gun,
a base support, a member rotatably mounted upon said
base support and comprised of a horizontal platform
having an upstanding core member concentrically posi-
tioned about the axis of rotation of the platform, whereby said ammunition belt may be spirally disposed in superposed layers about the surface of said upstanding core member as a center, means responsive to a power source for rotatably driving said member and thereby rotating all rounds of ammunition at an adjustable constant speed, and means for receiving the end of said belt and guiding a continuous strand of said rotating belt away from its circuitous path about said axis of rotation and conveying said strand to said gun, thereby unwinding the spiral layers of the belt from said member at the same speed.

4. In an apparatus for storing and feeding a continuous belt carrying rounds of ammunition to a rapid-fire gun, a base support, an ammunition carrier member including a base plate rotatably mounted to revolve about said support, a vertically upstanding member concentrically fastened upon said base plate to form a central core thereon, said core having a continuous outstanding flange spirally formed along its outer surface, whereby said ammunition belt may be supported upon the said base plate and spirally wound in superposed layers about said central core member as a center with the individual rounds resting upon said spirally wound flange, and a hollow feed chute reciprocally mounted upon said base support for movement along an axis parallel to the axis of rotation of said ammunition carrier and being driven in synchronism with the pitch of said flanges for receiving a continuously moving strand of said ammunition belt and diverting movement thereof from circuitous motion to rectilinear motion.

5. In an apparatus for storing and feeding a continuous belt carrying rounds of ammunition to a rapid-fire gun, a base support, a member rotatably mounted upon said base support and comprised of a platform having an upstanding core member concentrically positioned about the platform axis of rotation, the outer surface of said core member being provided with guiding means in the form of a continuous spiral, whereby said ammunition belt may be spirally disposed in superposed layers about the surface of said upstanding core member with a portion of each ammunition round resting on said guiding means, means for driving said rotatable member at an adjustably constant speed, and means for diverting a continuous strand of said rotating ammunition belt away from its circuitous path about the axis of rotation and guiding said strand in a rectilinear path to said gun at the same speed as the speed of rotation.

6. In an apparatus for storing and feeding a continuous belt carrying rounds of ammunition to a rapid-fire gun, a base support, a member rotatably mounted upon said base support and comprised of a platform having an upstanding core member cylindrically positioned about the platform axis of rotation, a variable speed motor for rotatably driving said rotatable member, the outer surface of said core member being provided with guiding means in the form of a continuous spiral whereby said ammunition belt may be spirally disposed in superposed layers about the surface of said upstanding core member as a center with a portion of each ammunition round resting upon said guiding means, and means for diverting a continuous strand of said rotating ammunition belt away from its circuitous path about the axis of said core member and guiding said strand in a path rectilinearly to said gun at the same speed.

7. In the apparatus of claim 5, said diverting means including a hollow feed chute member movable mounted upon said base support for reciprocal movement along an axis parallel to the axis of rotation of said core member and being driven in synchronism with the rotation of said core member and horizontal platform for receiving a continuous strand of said rotating belt and diverting said strand from its circuitous path about said axis of rotation to a path rectilinearly to said gun at the same speed.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Date</th>
<th>Inventor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,330,873</td>
<td>Feb. 17, 1920</td>
<td>Hulse</td>
</tr>
<tr>
<td>1,629,652</td>
<td>May 24, 1927</td>
<td>Browning</td>
</tr>
<tr>
<td>1,782,358</td>
<td>Nov. 18, 1930</td>
<td>Lang</td>
</tr>
<tr>
<td>1,973,446</td>
<td>Sept. 11, 1934</td>
<td>Rosenquist</td>
</tr>
<tr>
<td>2,453,786</td>
<td>Nov. 16, 1948</td>
<td>Dixon</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Country</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>315,058</td>
<td>Germany</td>
<td>Mar. 11, 1921</td>
</tr>
</tbody>
</table>