Sept. 18, 1951 A. W. GARDES 2,568,229

EXPENDED CLIP CARTRIDGE CHUTE FOR MACHINE GUNS

Filed March 5, 1948 2 Sheets-Sheet 1

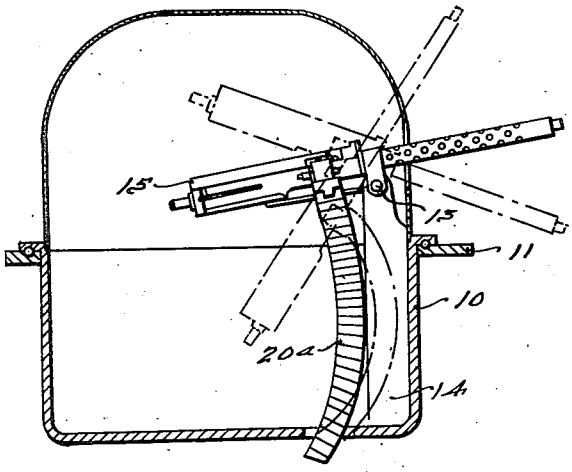


FIG. 1

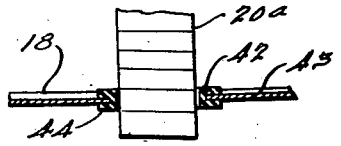


FIG. 5.

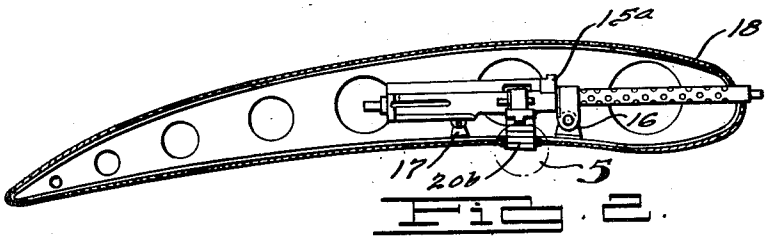
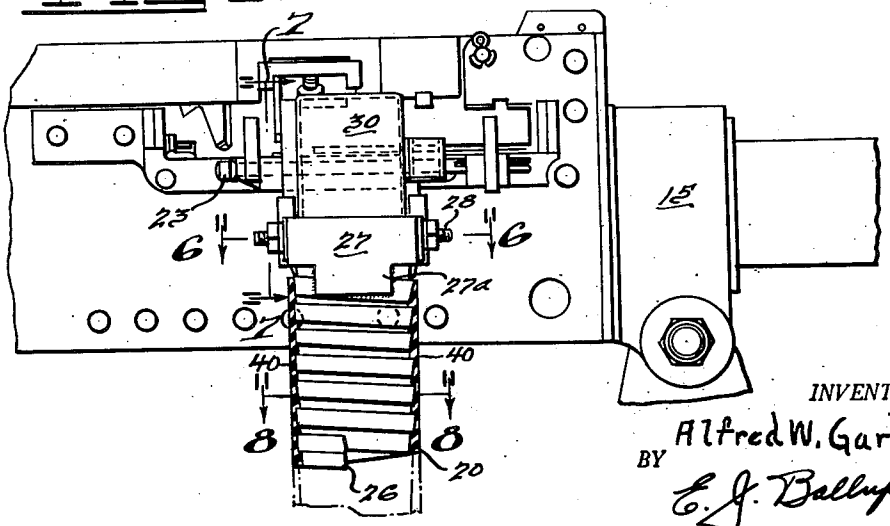


FIG. 2.

FIG. 3.



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EXPENDED CLIP CARTRIDGE CHUTE FOR MACHINE GUNS

Filed March 5, 1948 2 Sheets-Sheet 2

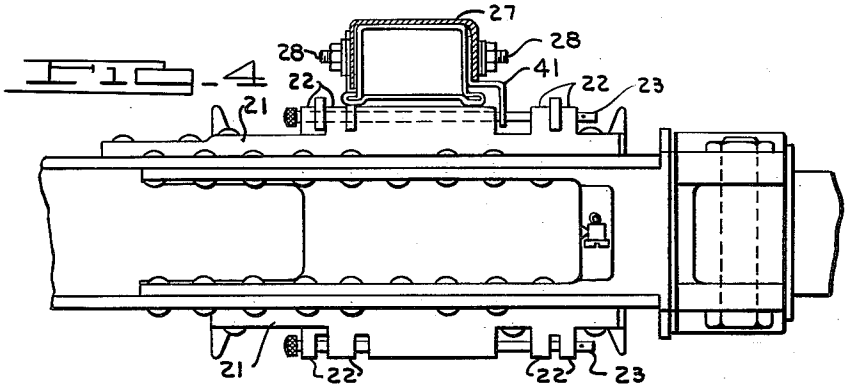


FIG. 4

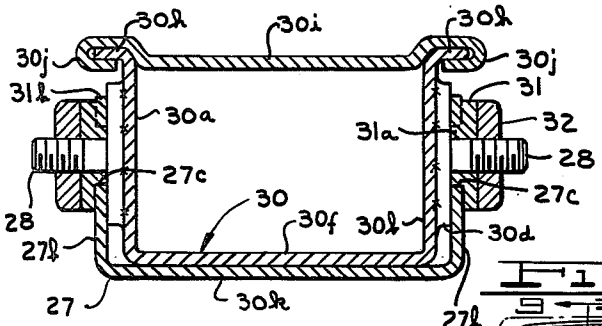


FIG. 6

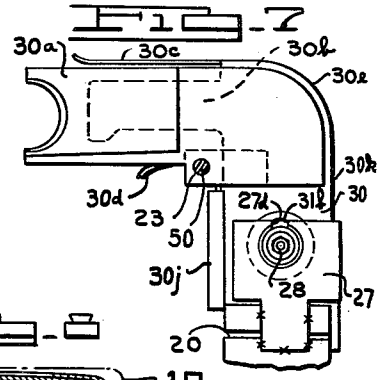


FIG. 7

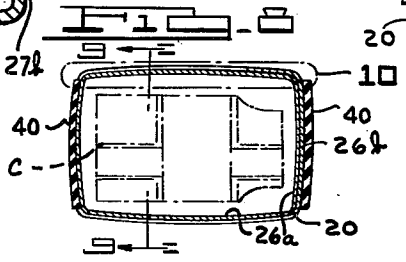


FIG. 8

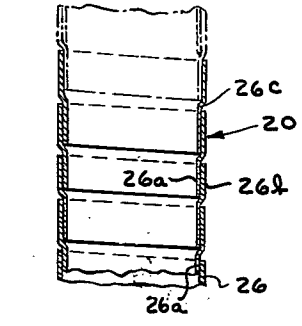


FIG. 9

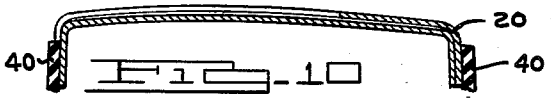


FIG. 10

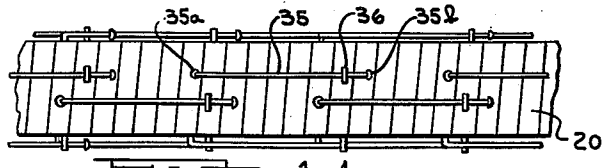


FIG. 11

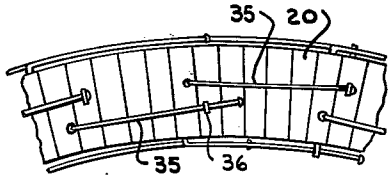


FIG. 12

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UNITED STATES PATENT OFFICE

2,568,229

EXPENDED CLIP CARTRIDGE CHUTE FOR MACHINE GUNS

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Continuation of application Serial No. 507,060, October 21, 1943. This application March 5, 1948, Serial No. 13,154

1 Claim. (Cl. 89—33)

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This invention relates to a new and improved construction of a chute for carrying away the expended clips ejected from aircraft machine guns and to a method of making the tubing which forms such a chute.

The shells used in the machine guns employed in aircraft are fed to the gun in the form of an endless belt formed by a plurality of metal clips provided with two spaced loop portions and a third loop portion, the third loop being adapted to fit between the pair of spaced loops of an adjacent clip. The shell casings of the shells or bullets fit snugly within the two spaced loops of the clips which are made of spring metal while the third loop of the adjacent clip partially surrounds the shell casing but with sufficient clearance to permit the clip to rotate freely upon the shell casing. The shells therefore act in a manner similar to the pivot pins of a chain. When the bullets are fired from the gun, the shell casings are ejected downwardly from the gun by the force of the expanding gases resulting from the firing of the shell while the metallic clips are ejected laterally from the side of the gun by a suitable ejection device operating in timed relationship with the firing of the gun.

The above features are characteristic of the Browning machine guns that are more or less standard equipment for the United States armed forces. These Browning machine guns are mounted in many different types of airplanes and are employed both as turret guns and wing guns. When used as turret guns, the clips which are ejected laterally from the side of the gun have heretofore been permitted to pile up on the floor of the turret. When the Browning guns are used in a fixed position in an airplane wing, it has heretofore been the practice to provide a chute of relatively large cross-sectional area into the upper end of which the clips are ejected by the clip-ejecting mechanism of the gun and the lower end of which chute is suitably secured to the wing structure and passes through an aperture provided in the skin on the underside of the airplane wing. As heretofore constructed, these chutes were made many times larger in cross-sectional dimension than the clips which are intended to pass through them, so that the chutes would not present any obstacle to the free passage of the metallic clips therethrough and thus permit them to fall freely by gravity through the chute and from the plane.

It has been found, however, in actual practice that when the airplane is traveling at a very high speed, such as is reached, for example, when the

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plane is in a dive—particularly a power dive—the air pressures which are built up at the lower open end of the clip chutes overcome the gravitational pull on the clip and thus not only prevent the clips from passing out of the lower open end of the chute but the pressures frequently blow or force the clips upwardly into the upper portion of the chute. As the machine guns fire with great rapidity and the expended clips are being forcibly ejected into the clip chutes in a steady, almost uninterrupted, stream, the clips frequently fill the relatively large clip chute and become tightly jammed therein, thereby rendering the machine gun inoperative and useless. When the clips do become so jammed and choke up the clip chutes, they are wedged in the chute very tightly because of the high velocity with which the clips are ejected from the gun, and consequently a jammed expended clip chute cannot be cleared during a flight but the trouble can only be corrected after the plane has been landed.

When the clips are ejected from a turret machine gun and permitted to pile up on the floor of the turret, the pile of clips which accumulates in the turret, particularly after an extended use of the gun, seriously hampers and impedes the turret gunner.

The principal object of the present invention is to provide a new and improved construction for an expended clip chute for aircraft machine guns by means of which the foregoing objections will be entirely obviated.

Another object of the present invention is to provide a clip chute so constructed and arranged not only so that no obstruction will be presented to the downward passage of the clips under the force of gravity, but so that a plurality of obstructions are presented which prevent the clips from moving upwardly in the clip chute as a result of high air pressures.

A further object is to provide a clip chute of the character described which is made of flexible material whereby the chute, when it is attached to a pivotally mounted gun such as is employed in a gun turret as distinguished from a fixed wing gun, will not interfere with the pivotal movements of the gun in either a horizontal or vertical plane in training the gun upon a target.

Another object is to so construct the chute that the desired flexibility thereof, as above described, may also be employed, by mounting the discharge or outlet end of the chute loosely, to cause the vibratory movements produced by the engines and propellers of the plane to impart a continuous shaking action to the chute which facilitates the

free passage, and prevents any jamming, of the clips within the chute.

A further object of the invention is to provide a clip chute of the character described with a new and improved attachment fixture or bracket by means of which the chute may be quickly and readily attached to a standard machine gun, and to so construct said fixture or bracket that the inner wearing surfaces thereof against which the clips are forcibly ejected by the clip-ejecting mechanism of the gun may be readily given a hard, wear-resistant coating or plating of a suitable metal, such as chromium, that will insure a relatively long period of longevity.

Another object is to provide a clip chute of the character described of comparatively simple and inexpensive construction, of comparatively light weight, yet withal of very sturdy construction capable of withstanding the rough usage of combat conditions.

Still another object of the invention is to provide a clip chute capable of handling a column of spaced clips as such column is ejected by a machine gun. In handling such column, the clip chute prevents the individual clips in the column from becoming laterally displaced with respect to one another by a distance greater than somewhat less than the width of a single clip. Under such circumstances, the clips may be blown back by the mouth of the clip chute or may otherwise be slowed down in their movement in the column by the inertia of the column due to the inertia of each succeeding clip and will maintain a continuous movement of the clips through the clip chute from which they will be discharged into the atmosphere.

Other and further objects of the invention will be apparent by reference to the accompanying drawings of which there are two sheets, which, by way of illustration, show preferred embodiments and the principles thereof and what I now consider to be the best mode in which I have contemplated applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claim. I also contemplate that of the several different features of my invention, certain ones thereof may be advantageously employed in some applications separate and apart from the remainder of the features.

In the drawings:

Fig. 1 is a somewhat diagrammatic view of an airplane turret equipped with a pivotally mounted machine gun and showing an expended clip chute constructed in accordance with the principles of the present invention attached to the gun and leading to a suitable aperture provided in the floor of the turret through which the expended clips are ejected;

Fig. 2 of the drawings is a similar somewhat diagrammatic view in vertical cross-section through an airplane wing showing a fixed machine gun mounted therein and having a clip chute attached thereto;

Fig. 3 is an enlarged side elevation of the midportion of a machine gun showing the improved clip chute attached to the side of the gun to receive the expended clips ejected by the clip-ejecting mechanism of the gun;

Fig. 4 is an inverted plan view of the mechanism shown in Fig. 3;

Fig. 5 is an enlarged side elevation of the lower part of the flexible clip chute substantially as contained within the dot-and-dash lined circle indicated at **5** in Fig. 2;

Figs. 6, 7 and 8 are sectional details taken substantially on the lines **6—6**, **7—7** and **8—8** of Fig. 3;

Fig. 9 is a sectional detail taken substantially on the line **9—9** of Fig. 8;

Fig. 10 is an enlarged sectional detail of that portion of the clip chute shown in Fig. 8 and enclosed within the area of the dot-and-dash line **10**;

Figs. 11 and 12 are views in side elevation of a construction of the flexible clip chute in which the exterior side walls thereof have secured to them a plurality of guide rods or wires which serve to prevent malalignment of adjacent convolutions of the chute as a result of the flexing or curving of the chute.

In Fig. 1 of the drawings there is shown a cross-sectional view of a gun turret such as is employed in combat airplanes and equipped with what might be termed a dirigible machine gun by which is meant a gun that is pivotally mounted to be trained by the gunner upon a target. The constructional details of the turret or gun mounting and likewise of the machine gun per se form no part of the present invention. It will be sufficient to note that the turret consists of a base **10** mounted for rotation about the vertical central axis of the turret upon a suitable supporting structure indicated by the reference character **11**. The machine gun **15** is pivotally mounted as at **13** upon any suitable support, such as **14**.

In Fig. 2 of the drawings the machine gun **15***a* is shown as fixedly secured by the brackets **16** and **17** in a wing **18** of an airplane. The machine guns **15** and **15***a* shown in Figs. 1 and 2 are provided respectively with expended clip chutes constructed in accordance with the principles of the present invention which are indicated generally by the reference characters **20***a* and **20***b*. The construction of the clip chute and of the means for attaching it to the machine gun can best be understood generally by reference to Figs. 3 and 4 of the drawings, wherein is shown that portion of a standard machine gun in which the cartridge clip-ejecting means is housed. As shown in these figures, the machine gun has secured to the side faces thereof bracket members **21**, which are provided with a plurality of laterally projecting apertured lugs **22** in which is received a pin **23** adapted to be readily withdrawn from or inserted into the apertured lugs **22**, and which serves for attaching to the gun an expended clip-ejecting chute through which are ejected the metallic clips that are employed for securing the shells fed to the gun in an endless belt as hereinbefore described.

Fig. 3 shows a clip chute of the present invention which consists of the main chute portion indicated generally by the reference character **20** attached to the gun by means of a fixture or bracket indicated generally by the reference character **30**.

As will appear from an inspection of the drawings, and particularly Figs. 5 to 10, inclusive, the chute **20** is preferably formed of a strip **26** of thin spring sheet metal. This strip is also preferably formed so that the lower longitudinally extending section **26***a* of the strip is offset inwardly from the upper longitudinally extending section **26***b* thereof, as shown best in Fig. 9 of the drawings; an operation which can be readily performed by rolling a plain flat strip of material. Between the

offset sections are shoulders 26c, likewise extending longitudinally of the strip. After the flat strip of material has been rolled or otherwise fabricated to provide the offset portions 26a, 26b, and the shoulders 26c, the strip is then spirally wound upon a mandrel of generally rectangular cross-section so as to form the convolutions indicated in Fig. 9 in which the portion 26b of each convolution fits neatly about the smaller offset portion 26a of an adjacent turn or convolution of the spiral. During the winding of the strip, it is necessary to tension the strip in order to stretch the outer section 26b around the corners of the mandrel so as to continue the shoulder 26c around such mandrel corners and so that the length of the outer sections 26b will be longer and fit over the inner sections 26a.

The winding of the strip upon a rectangular mandrel forms the chute 20 into a hollow, substantially continuous tube of rectangular cross-section as indicated in Fig. 8 of the drawings through the interior of which the expended clips C are adapted to pass.

Suitably secured to the upper end of the spirally wound spring steel chute 20 is an attachment fixture 27 formed of heavier sheet metal and of generally U-shaped configuration, the fixture 27 having a plurality of downwardly extending lugs 27a which are preferably brazed or otherwise suitably secured to the helical tube 20. The side legs 27b of the fixture 27 are provided with keyhole-shaped slots or apertures, in the circular portion 27c of which is adapted to be received the threaded studs 28 which project laterally from washers 27d brazed or otherwise secured to the opposite sides of the attachment bracket 30 presently to be more fully described, the open ended straight portions 27d of the keyhole slots being provided for facility in quickly assembling the chute 20 to the attachment bracket 30. In order to more firmly secure the chute 20 to the attachment bracket 30 and prevent movement thereof, a washer 31 is placed over each of the studs 28 and said washer is provided with an inwardly extending circular boss 31a which fits snugly within the circular portion 27c of the keyhole slot; said washer is also provided with a laterally extending tongue 31b which fits neatly within the straight portion 27d of the keyhole slot. Nuts 32 are threaded upon the studs 28 to clamp the U-shaped attachment fixture 27 securely to the attachment bracket 30.

The bracket or fixture 30 is in the form of an L shape which serves to direct the expended clips that are ejected laterally from the side of the machine gun in a horizontal direction, downwardly into the clip chute 20. The horizontal portion of the bracket is formed by two laterally projecting side walls or legs 30a and 30b (see Fig. 7) which are suitably formed at their upper ends to engage with cooperating parts formed in the machine gun for engagement by the legs 30a and 30b of the attachment fixture to locate it properly in position with respect to the clip-ejecting mechanism of the gun. In addition to the side walls 30a, 30b, the fixture 30 is also provided with a top wall 30c and a bottom wall 30d which in cooperation with the side walls 30a and 30b form an open rectangular guideway or chute through which the clips pass in a horizontal direction. Intermediate the ends of the walls 30a to 30d, inclusive, the fixture is curved as indicated at 30e to direct the expended clips downwardly into the vertical leg portion of the L-shaped fixture. This vertical leg portion is formed by a U-shaped fixture. This vertical leg portion is formed by a U-shaped section 30f (see Fig. 6) the side walls 30g of which have formed at their extremities the laterally extending flanges 30h. The back cover plate 30i has its side edges bent around as indicated at 30j so that the back cover plate 30i may be slidably and detachably mounted upon the main fixture, the lower wall 30d of the chute as above described being formed integral with the back plate 30i. The purpose of mounting the back cover plate slidably and detachably upon the main fixture is to enable the inner face of the lower vertical wall portion 30k of the wall 30c of the fixture 30 to be exposed for plating the wall of the attachment fixture 30 with a hard, wear-resistant coating of suitable metal, such as chromium. If the attachment fixture were made of a single piece of metal, the inner surface of the wall 30k of the attachment fixture could not be plated as the plating could not be effectively "thrown"—as the expression is used in the plating art—down into the inside of a closed chute.

As the flexing of the spirally-wound flat steel strip portion 20 of the chute tends to slip the outer offset or enlarged sections 26b of an adjacent convolution out of engagement with the cooperating inner offset section 26a of the adjacent convolution and thereby result not only in misalignment of the tube convolutions and also to result in gaps or openings between adjacent convolutions, means are provided to prevent undue lateral movement between adjacent convolutions, to hold the convolutions in proper alignment, and to bridge any gaps which might be caused by flexing the tube. Such means comprises the rods 35 which as shown in Figs. 11 and 12 are secured in staggered, overlapping relationship upon all four sides of the chute 20. Each rod 35 is provided at one end thereof with an inwardly bent enlarged head 35a which is brazed, welded or otherwise suitably fixedly secured to one of the convolutions of the chute. The other end of each rod is provided with an enlarged head 35b. Each rod 35 passes slidably through an eye 36 which is also fixedly secured to a convolution of the chute and serves as a lmiting stop against which the enlarged head 35b engages, as shown more clearly in Fig. 12 of the drawing. The rods 35 thus serve to limit the opening movement of the adjacent convolutions and thereby prevent misalignment thereof as hereinbefore described.

The manner in which the parts heretofore described are fabricated is as follows: The fabrication and formation of the chute portion has already been fully described. After the chute has been formed into the rectangular convoluted form, the rods 35 are attached and spaced in overlapping, staggered relationship, as indicated in Fig. 11. After the fixture 30 has been formed into the desired shape with the projecting legs 30a, 30b and 30c and also with the flanges 30h at the extremities of the walls 30a and 30b, the fixture is placed in a suitable electro-plating bath and a coating of wear resistant metal is placed thereon. The back plate 30i of the fixture is also similarly plated after which the back plate 30i is slid upon the flanges 30h and in a position such that the leg 30d of the plate will occupy a position such as is shown in Fig. 7. The chute 20 to which the attachment fixture 27 has been suitably secured, as by brazing is then slid over the lower end of the fixture 30, the open ends of the shtraight portions 27d of the keyhole slots being slid over the studs 28. The washers 31 are then placed over the studs and the nuts 32 threaded

onto the bolts and tightened thereon to hold the chute firmly attached to the fixture 30. The dimension of the chute relative to the lower end of the fixture 30 is such that when the chute has been secured to the attachment fixture 30 the upper end of the chute engages with the slidable back plate 30*i* of the fixture and holds it against downward movement and securely in proper position.

The first clip chutes constructed in accordance with the foregoing principles were made of strip steel approximately three-quarters of an inch in width and while these proved quite satisfactory in practice, however, it was found that when the chute was flexed beyond a certain amount it was desirable to employ the rods 35 to prevent adjacent convolutions of the spirally wound strip from shifting laterally out of proper alignment. The use of the three-quarters of an inch wide strip coupled with the rods 35 resulted in impressing to great limitation upon the extent to which the chute could be flexed, and consequently a further improved construction was developed. This improved and preferred construction is best illustrated in Figs. 3, 8 and 10 of the drawing. It consists in employing a much narrower strip of flat steel for forming the chute, the width of such steel being of the order of approximately three-eighths of an inch in width. After the tube has been fabricated by winding the narrower strip upon a square mandrel, it being understood that before winding the strip it is offset as indicated at 26*a* and 26*b* in Fig. 9 of the drawing, there is bonded to the two narrow side walls of the tube a continuous strip of rubber or other suitable flexible material 40, as indicated in Figs. 3, 8 and 10 of the drawing. The rubber of the bands is bonded to the metal of each convolution of the strip by sulphurization and heat treatment until the surface to be applied to the metal is softened sufficiently so that it may be applied to the metal and firmly pressed into contact therewith so that upon cooling it is so firmly united to the metal that it is practically impossible for it to be detached therefrom. It will be apparent that the bands may be adhesively secured to the tube convolutions in any other manner which it may be desired to employ. By reason of the use of the narrower strip steel material forming the convoluted tube and also, because of the securing of the strip of flexible rubber 40 to the convolutions thereof, the flexible properties of the tube or chute are somewhat different. The use of the narrower metal permits the tube to be bent or curved on a radius of much smaller curvature than is possible when the wider strip material is used as will be readily apparent. The substitution of the strips of flexible rubber 40 along the two sides of the tube changes the limiting factors which are impressed upon the structure when the slidable metal rods 35 are employed, the rubber strips functioning to prevent misalignment of the adjacent convolutions when the tube is bent or flexed through a bend of very sharp or short curvature and holding the edges of the adjacent convolutions in accurate alignment with each other. It will also be apparent that it will be much more difficult to bend the tube by expanding and contracting the sides of the tube to which the bands 40 are attached than it will be to bend the tube at 90 degrees with respect to the bands. The stretching of the bands also does limit the expansion of the tube and the bending thereof, both longitudinally and in any direction.

After the chute and attachment fixture have been assembled as just described, it forms a unitary assembly which can be readily attached to the side of the machine gun, the legs 30*a* and 30*b* being entered into the suitable slots provided in the bracket 21 on the side of the gun for engagement with the cooperating parts formed in the gun. The rod 23 is then passed through a suitable hole 50 (Fig. 6) provided in the leg 30*b* of the fixture and through another hole 50 provided in a small bracket 41 (Fig. 4) that is attached to the side wall of the fixture 30.

When the chute is attached to a fixed wing gun the lower end of the chute 20*a* passes through a suitable hole 42 (Fig. 5) provided in the skin 43 of the wing 13. As clearly shown in Fig. 5, the lower end of the chute projects down below the lower skin of the wing and a clearance space is left between the chute and a buffer strip 44, thereby to permit the chute to have a shaking or vibrating section imparted to it by the vibrations of the airplane.

In the actual operation of the gun, the clips are ejected laterally in a horizontal direction in a column of spaced clips from the side of the gun into the attachment fixture 30 by which they are deflected by the curved wall 30*e* thereof downwardly in a vertical direction into the chute 20. As will be readily seen from the foregoing description and particularly by reference to Fig. 9 of the drawing, the overlapping of the inner offset ends of each convolution over the adjacent outer offset portion 26*b* of the next convolution results in the formation in the interior of the chute of a substantially smooth surface or at least one in which there are no projections that can tend to impede the downward passage of the clips through the chute. This overlapping, however, results in the formation of a slight projection by the lower edge of each inner offset portion 26*a* of each convolution against which the clips will tend to strike if the air pressure on the lower end of the chute is sufficiently high to tend to move the clips upwardly. As will be seen from the dotted line showings of the clip in Fig. 8 of the drawing, the cross-sectional dimension of the chute is but slightly larger than the outer dimensions of the clips. As a result, it is impossible for the clips to turn or twist and thus become caught and therefore wedged in the chute. As the gun continues firing and the clips are ejected rapidly into the chute, the clips pass through the chute in a vertical column so that even if the air pressures are sufficiently high as to tend to blow the individual clips backwardly and upwardly into the chute, the inertia of the vertical column of clips will always be sufficient to overcome the air pressure. In addition, the continual shaking imparted to the chute by the vibrations of the gun, together with the loose mounting of the lower end of the chute, effectively prevents any jamming of the clips within the chute.

While I have illustrated and described preferred embodiments of my invention, it is understood that these are capable of modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claim.

This application is a continuation of my copending application, Serial No. 507,060, filed October 21, 1943, for "Expended Clip Cartridge Chute for Machine Guns," which has been abandoned.

I claim:

For use with a machine gun, an expended cartridge clip chute comprising a generally ver-

tical flexible tube formed of a single strip of thin resilient material spirally wound to form overlapping convolutions and to define a tube of rectangular cross section generally conforming to the shape of the expended cartridge clip and having a cross section large enough to accommodate the passage of only a single clip at one time, an attachment bracket for detachable engagement with the machine gun, said attachment bracket being internally coated with a hard wear-resistant coating, means for detachably securing said tube to said bracket, said attachment bracket being formed of a strip of sheet metal of generally U-shaped cross-sectional configuration and provided with a detachable guide plate bridging the open legs of the U whereby the entire inner surface of the U-shaped configuration of said attachment bracket may be completely exposed for subjecting the interior to the action of a plating bath, said attachment bracket and guide plate being provided with cooperating interengaging means for holding said guide plate against lateral movement relative to said attachment bracket, and said clip chute being provided with means for engaging said guide plate and holding it against vertical displacement relative to said attachment bracket.

ALFRED W. GARDES.

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