July 28, 1953 F. C. EASTMAN 2,646,722

DEVICE FOR DISPOSING OF EJECTED CARTRIDGE CASES

Filed Nov. 19, 1947 2 Sheets-Sheet 1

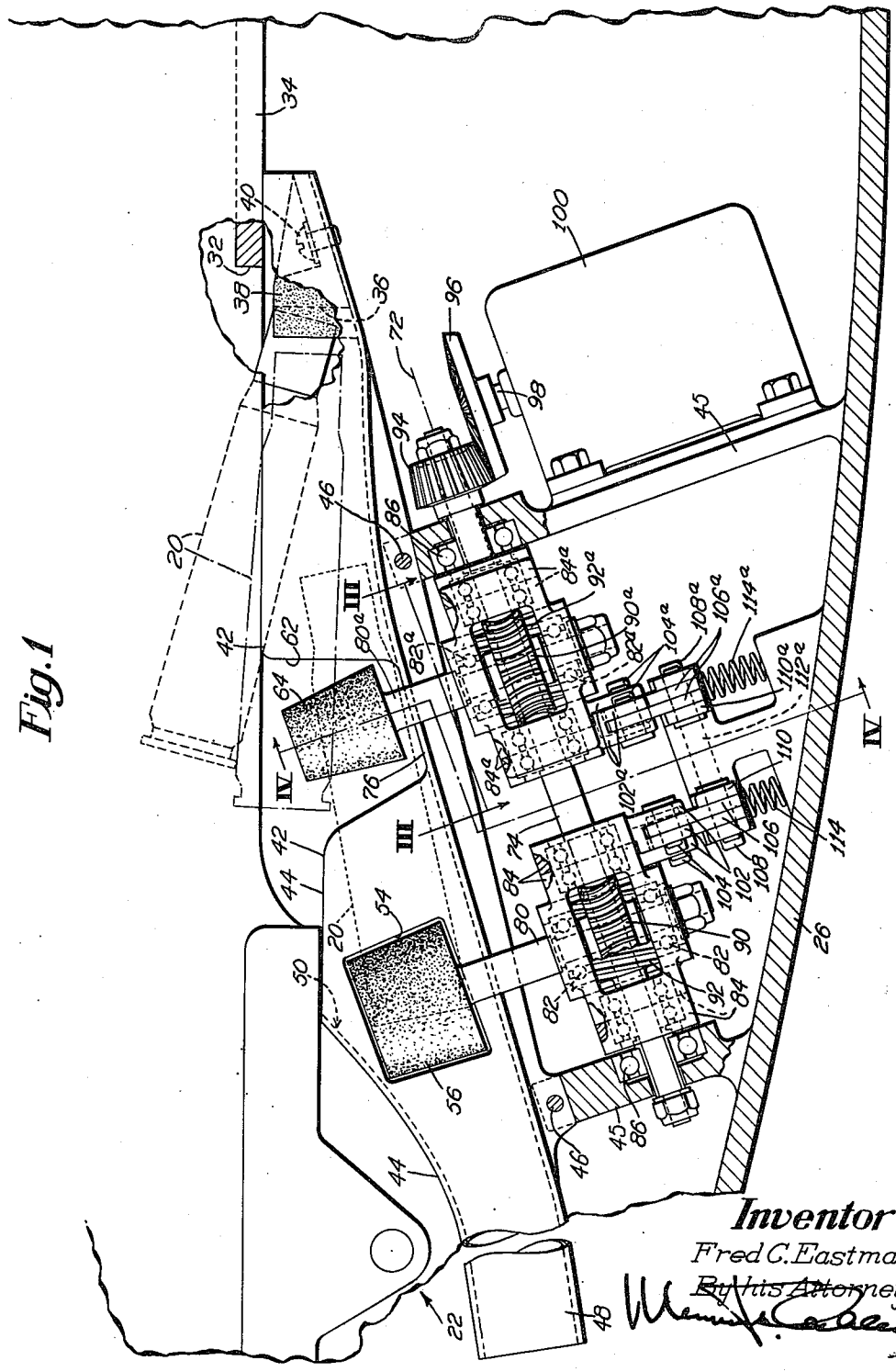


Fig. 1

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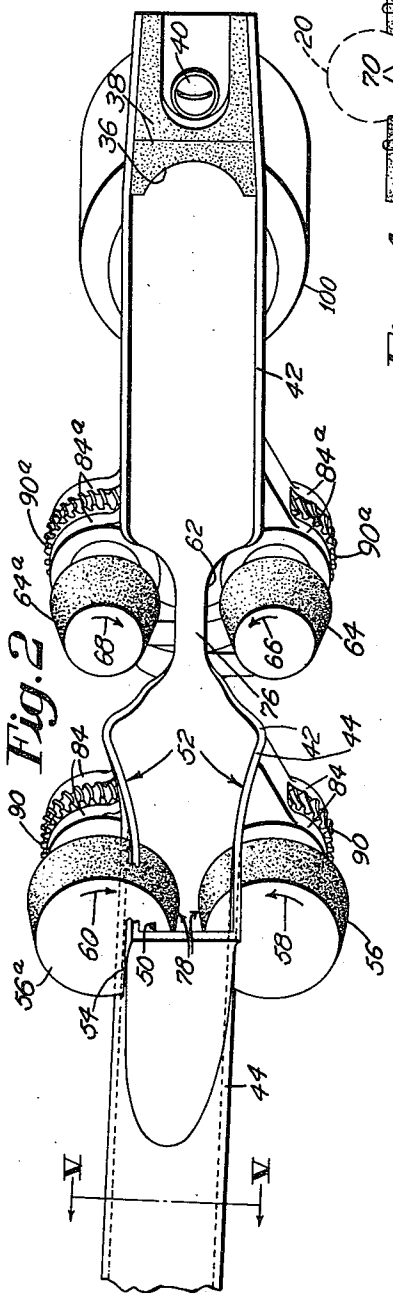


Fig. 2

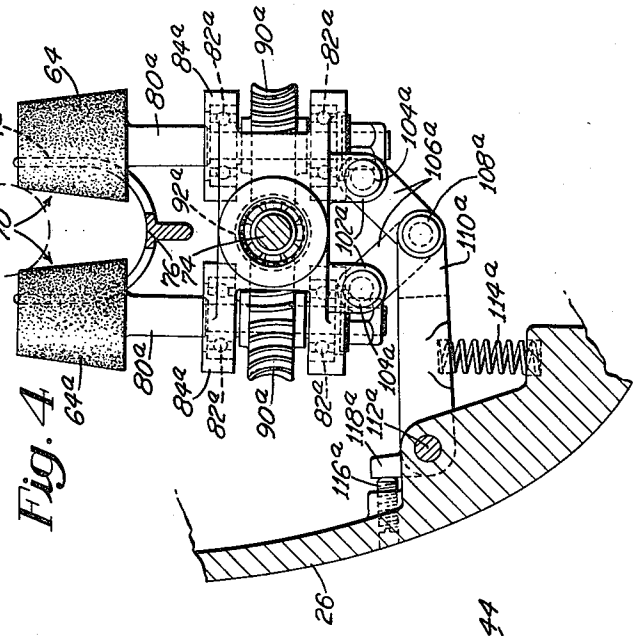


Fig. 4

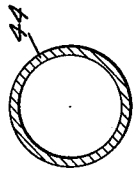


Fig. 5

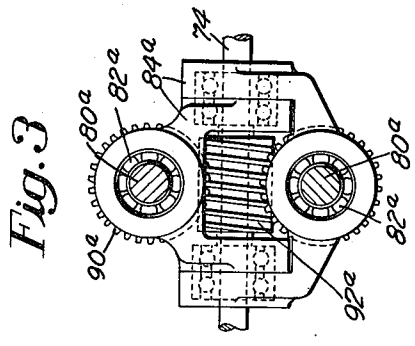


Fig. 3

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DEVICE FOR DISPOSING OF EJECTED CARTRIDGE CASES

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3 Claims. (Cl. 89—33)

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This invention relates to ordnance and is illustrated as embodied in a device for disposing of cartridge cases ejected from automatic guns of small caliber.

The disposal of empty cartridge cases, which have been ejected from automatic guns mounted in turrets and other confined portions of airplanes, has been a problem because of the fact that the empty cartridge cases cannot be dropped from the airplane during its flight without the danger of being engaged by the propellers or other parts of the airplane.

It is an object of the present invention to provide means for receiving cartridge cases ejected from automatic guns mounted in an airplane and for conveying them to a suitable depository in the airplane remote from the guns.

The invention will be illustrated herein with reference to the well-known .50 caliber Browning machine gun but is equally applicable to guns of medium caliber. Furthermore, disposal means of the type illustrated herein may be used with automatic machinery such as produces or operates upon elongated articles which are successively ejected from the machine and which, in order to avoid stoppage of and/or to insure against the operator being injured by the machine, it is desirable to convey to depositories remote from the machine.

With the foregoing considerations in view, the invention in its broader aspect resides in mechanism for disposing of elongated articles, which are successively and forcibly ejected from an automatic machine, by conveying said articles to a place remote from the machine. Such mechanism comprises a conduit having a trough-shaped portion or end, which is located adjacent to a place of ejection of the article from the machine, for receiving said article, and a terminal end remote from the machine.

In accordance with a feature of the present invention, a buffer is arranged at the receiving end of the trough-shaped portion of the conduit for limiting ejecting movement of the article, and rotatable thrust members are located at opposite sides of the trough-shaped portion of the conduit at positions less distant from the buffer than the length of the article, said members having diverging frusto-conical surfaces, which are initially positioned a predetermined distance apart, for effecting entry of the trailing end of the article between them, and means for moving the article engaging portions of said surfaces rapidly toward the terminal end of the conduit to impart to the article disposed in the trough-shaped portion of the conduit, sufficient velocity to propel said article to the terminal end of said conduit.

When used for disposing of empty cartridge cases ejected from a gun, the trough-shaped portion of the conduit is located beneath an ejection

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opening of the gun, the buffer in the trough-shaped portion being shaped and arranged to limit ejecting movement of the empty cases, and the thrust members having case engaging portions of their diverging frusto-conical surfaces moving toward the terminal end of the conduit for receiving between them the rear ends of the cartridge cases and for imparting to the cases velocity sufficient to cause said cases to be propelled to the terminal end of the conduit. As illustrated the aforesaid rotatable thrust members are bodily yieldable relatively to each other to insure continuous engagement of the thrust members with the tapering cartridge cases as said cases pass between the members. Entry of the ejected cartridge case between the thrust members is facilitated by stops which, when the members are inactive, hold them a minimum distance from each other, such distance being adjustable.

The illustrative thrust members have the form of rubber covered frusto-conical rolls which are arranged at opposite sides of the trough-shaped portion of the conduit and are rotatable about axes extending generally heightwise thereof but inclined slightly toward the rear end of said trough-shaped portion, the case engaging portions of the frusto-conical surfaces of said rolls being rotated in directions to draw the cartridge case then in engagement with the buffer into the trough-shaped portion of the conduit and to propel it with considerable force toward the terminal end of said conduit. More than one pair of said rolls may be, and as illustrated, are employed to insure that the cases shall be effectively transferred to the terminal end of the conduit.

The various features of the invention will be understood and appreciated from the following detail description read in connection with the accompanying drawings in which

Fig. 1 is a vertical section through a lower portion of a fairing of an airplane showing in side elevation a lower portion of a gun and a device for disposing of empty cartridge cases ejected from the gun;

Fig. 2 is a plan view of the cartridge case disposing device illustrated in Fig. 1;

Figs. 3 and 4 are sections on lines III—III and IV—IV respectively of Fig. 1; and

Fig. 5 is a section on line V—V of Fig. 2.

The invention is illustrated with reference to the disposal of empty cartridge cases **20** (Fig. 1) successively and forcibly ejected from a .50 caliber gun **22** which is mounted for movement in azimuth and elevation upon a hollow support (not shown) forming part of and projecting forwardly from a fuselage of an airplane. In such a construction the empty cartridge cases **20** after their ejection cannot safely be dumped through a chute directly into space because of the danger of the cases striking airplane parts, such for ex-

ample, as propellers (not shown) which are commonly arranged at opposite sides of the fuselage.

In order to reduce wind resistance of the airplane to a minimum and to protect the gun 22, said gun has secured to it a bulb-shaped fairing 26 operatively connected to the projecting support by a zone of nested rings forming an articulated fairing which serves as a cover for training mechanism for the gun.

The empty cartridge cases 20 are ejected downward and forward from the gun 22 through an opening 32 (Fig. 1) at the bottom of a receiver 34 of the gun, said cases being inclined at an angle such as shown in Fig. 1 during their ejecting movement. Movement of each of the ejected cartridge cases 20 toward the forward end of the gun is arrested by engagement of the forward or open ends of the cases with a concave face 36 (Figs. 1 and 2) of an impact absorbing buffer or pad 38, the rear end of which is made of rubber and the forward end of which is made of steel and is secured by a screw 40 to a trough-shaped forward or receiving end 42 of a conduit 44. The conduit 44 is secured to a bracket 45 (Fig. 1) of the fairing 26 by bolts 46 and has its trough-shaped end 42 arranged opposite and adjacent to the opening 32 of the gun. A delivery or terminal end 48 (Fig. 1) of the conduit which is remote from the gun extends into the gun support from which the empty cases are removed after the airplane has grounded. In describing the conduit 44 a dimension extending between a cartridge receiving open portion of the conduit and the bottom of the conduit will be defined as extending heightwise of the conduit.

The trough-shaped end 42 of the conduit 44, except for cut away portions which will be referred to later, is high sided as best shown in Fig. 1, the portion of the conduit which extends rearward from line V—V of Fig. 2 and may be defined as the cylindrical or tube portion of the conduit, being of circular cross section. The portion of the conduit just forward of line V—V flares upward forming a deflecting surface 50 (Figs. 1 and 2) and arranged just forward of said surface are laterally flared side wall surfaces 52 (Fig. 2). Sides of the conduit 44 adjacent to the deflecting surface 50 have formed in them openings 54 for receiving frusto-conical rolls or thrust members, 56, 56*a* (Fig. 2) which are continuously driven in directions 58, 60 respectively by mechanism which will be described later.

Arranged at opposite sides of the trough-shaped portion 42 of the conduit 44 in notches 62 (Figs. 1 and 2) are continuously driven frusto-conical rolls or thrust members 64 (Figs. 1, 2 and 4), 64*a* (Figs. 2 and 4) which are of the same height as rolls 56, 56*a* and are rotatable in directions 66, 68 (Fig. 2) respectively and are supported for rotation by mechanism which will be described later.

At the time the cartridge case 20 normally engages the face 36 of the rubber buffer 38, as shown in dash lines (Fig. 1), its rear end engages or is dropping toward spaced opposing portions 70 (Fig. 4) of the frusto-conical surfaces of rolls 64, 64*a* which at that time are spaced a sufficient distance apart to grip the case, said rolls thereafter moving yieldingly equal distances in opposite directions about an axis 72 (Fig. 1) of a drive shaft 74 (Figs. 1, 3, and 4) while the case, as experimentation has demonstrated, is drawn down between the rolls, until said case engages a strip portion 76 of the bottom of the trough-shaped portion 42 of the conduit 44. As the case 20 is drawn toward the bottom of the trough-shaped portion 42 of the conduct 44, it moves rearward, the case, before being disengaged by the rolls 64, 64*a* being forced between and gripped by the frusto conical rolls 56, 56*a* which also swing yieldingly away from each other about the axis 72 of the drive shaft 74 under the rearward action of the case (see dotted line position of the case in Fig. 2). It has been found that the cartridge cases 20 sometimes engage the rolls 64, 64*a* before engaging the buffer 38 and when this occurs the front end of the empty case moves down into engagement with the trough-shaped portion of the conduit as the case starts back under the action of the rolls, the rear end of the case thereafter being drawn down by the rolls. It will be understood that although the illustrative rolls are covered with rubber they may be made of or covered with fiber or various other materials. Movement of opposing case engaging portions 78 (Fig. 2) of the frusto-conical rolls 56, 56*a* generally rearward of the conduit 44 causes the cases 20 to be forced or propelled rearward with considerable speed, the deflecting faces 50, 52 of the conduit facilitating, if necessary, the guiding of the cases into the cylindrical portion of the conduit. The speeds of different heightwise portions of the frusto-conical surfaces of the rolls 56, 56*a* is slightly greater than that of corresponding heightwise portions of the frusto-conical surfaces of rolls 64, 64*a*.

Whenever the gun 22 is pointed toward the ground, and accordingly the cases 20 have to be raised against the action of gravity, the cases may not be thrown one by one along the entire length of the cylindrical portion of the conduit and from the terminal end of said conduit 44, the cases under such conditions extending end against end in the conduit. It will be understood, however, that the propelling force of the rolls 56, 56*a* and 64, 64*a* is sufficient to force the "string" of empty cartridge cases in the conduit, by pushing action, out of the conduit, said string of cases being cleared from the conduit when the gun is again elevated toward a horizontal position.

The frusto-conical rolls 56, 56*a*; 64, 64*a* have formed integral with them shafts 80, 80*a* mounted for rotation in ball bearings 82 (Fig. 1), 82*a* (Figs. 1, 3 and 4) carried by pairs of inner and outer yokes 84, 84*a* supported for pivotal movement upon the shaft 74 which is rotatable in bearings 86 (Fig. 1) mounted in the brackets 45. Secured to the shafts 80, 80*a* are worm gears 90, 90*a* meshing with worms 92, 92*a* pinned to the drive shaft 74 which has secured to its forward end a bevel gear 94 (Fig. 1) meshing with a bevel gear 96 fixed to a shaft 98 of a motor 100 bolted to one of the brackets 45. Each of the yokes 84, 84a has a pair of spaced depending ears 102 (Fig. 1), 102*a* (Figs. 1 and 4) pivotally connected through a pin 104, 104*a* and links 106, 106*a* to a pin 108, 108*a* carried by a bifurcated end of a lever 110, 110*a*, the lever 110*a* being fulcrumed on a pin 112*a* carried by the fairing. The levers 110, 110*a* are continuously urged upward by springs 114, 114*a*, upward movement of the lever 110*a* acted on by the spring 114*a* being limited by an adjustable screw or stop 116*a* which is engaged by a lug 118a of the lever 110a. When no cartridge cases 20 are being ejected the rolls 56, 56*a*,

64, 64a are in their positions shown in Figs. 2 and 4, the lug 118a of the lever 118a being forced against the screw 116a by the action of the spring 114a. Upward movement of the lever 118 and accordingly movement of the rolls 56, 56a toward each other is limited by mechanism corresponding to that described in connection with the rolls 64, 64a.

When a case 20 is ejected from the gun 22 through the opening 32 in the magazine 34, its forward or open end engages the concave face 36 of the buffer 38 thereby arresting movement of the case in a direction generally forward of the conduit 44. It will be noted that the distance between the buffer 38 and the rolls 64, 64a is slightly less than the length of each of the cases 20, the construction and arrangement being such that after the front end of each of the cases has engaged the buffer, the rear end of the case drops between the spaced opposing portions 70 (Fig. 4) of the frusto-conical rolls 64, 64a which are at that time adjusted to permit partial entry of the case between the rolls. As the case 20 engages the frusto-conical surfaces of the rolls 64, 64a, which surfaces may be said to diverge as they approach the gun 22, said rolls simultaneously draw the case down against the bottom of the trough-shaped portion 42 of the conduit 44 and toward the terminal end of said conduit. As the portions of reduced diameter of the case are engaged by the rolls 64, 64a, said rolls operating under the action of the spring 114a close in on the case thereby insuring that the case shall be effectively propelled along the trough-shaped portion 42 of the conduit 44.

The distance between the rolls 64, 64a and the rolls 56, 56a is somewhat less than the length of the case, the construction and arrangement being such that the case 20 is well gripped between the rolls 56, 56a before being released by the rolls 64, 64a. It will be understood that the rolls 64, 64a alone may be relied upon to transfer the cases through the conduit 44 into the hollow support 24. In order, however, to insure that the cases shall be transferred effectively under all conditions of flight to the hollow support 24 the additional rolls 56, 56a are provided.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A device for transferring articles successively and forcibly ejected through an opening of a machine to positions remote from the machine, comprising a conduit having a portion arranged adjacent to said opening for successively receiving said articles and a terminal end remote from said machine, a resilient buffer which is positioned at the receiving portion of the conduit and which engages the front ends of the ejected articles and absorbs the impacts of said articles as well as substantially stops ejecting movement of said articles, spaced rotatable members located at opposite sides of the conduit and spaced lengthwise of the conduit from the buffer a less distance than the lengths of the articles, said members having conical surfaces which diverge as they approach the machine and which are shaped and arranged to receive the rear end of each of the articles substantially simultaneously with the engagement of the front end of such article with the buffer, opposed portions of said conical surfaces being moved rapidly toward the terminal end of the conduit to draw the articles into the conduit and simultaneously therewith to propel them with considerable force in a direction substantially different from the direction in which they are ejected through the opening of the machine and rear ends first toward the terminal end of the conduit, and power means for operating said members.

2. A device for disposing of empty cartridge cases successively ejected through an opening of an automatic gun, comprising a conduit having a receiving end arranged adjacent to said opening of the gun and a terminal end remote from the gun, a resilient buffer which is positioned at the receiving end of the conduit and is constructed and arranged to be engaged by the front end of the empty case and which substantially stops ejecting movement of said cartridges, members which are arranged at opposite sides of the conduit and are spaced lengthwise of the conduit from the buffer, said members having moving surfaces which diverge as they approach the gun and are adapted to receive between them the base portion of a case substantially simultaneously with the engagement of the front end of the case with the buffer and to impart sufficient velocity to the case toward the terminal end of the conduit and in a direction substantially different from the direction in which the cartridge is ejected through the opening in the gun and base portion first to eject the case through and out of the terminal end of the conduit, power means for operating said members, and means for causing said members to yield under pressure as units away from each other to admit the cases between them and to insure continuous transferring engagement of said members with the cases.

3. A device for disposing of empty cartridge cases successively ejected through an opening of an automatic gun, comprising a conduit having a case receiving end arranged adjacent to said opening in the gun and a terminal end remote from the gun, a buffer at the case receiving end of the conduit constructed and arranged to be engaged by the open end of a case, spaced members located at opposite sides of the conduit at points less distant from the buffer than the length of the case, said members being bodily movable toward and away from each other and having surfaces that diverge as they approach the gun and are constructed and arranged to receive between them the base portions of the cases substantially simultaneoulsy with the engagement of corresponding cases with the buffer, means for effecting movement of the case-engaging portions of said surfaces in a direction toward the terminal end of the conduit at a high velocity to project the cases through the conduit to the terminal end thereof, means for yieldingly urging said members toward each other, and stops for maintaining said members spaced a predetermined distance from each other initially to receive said cases.

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