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PROJECTILE TRANSFER MECHANISM

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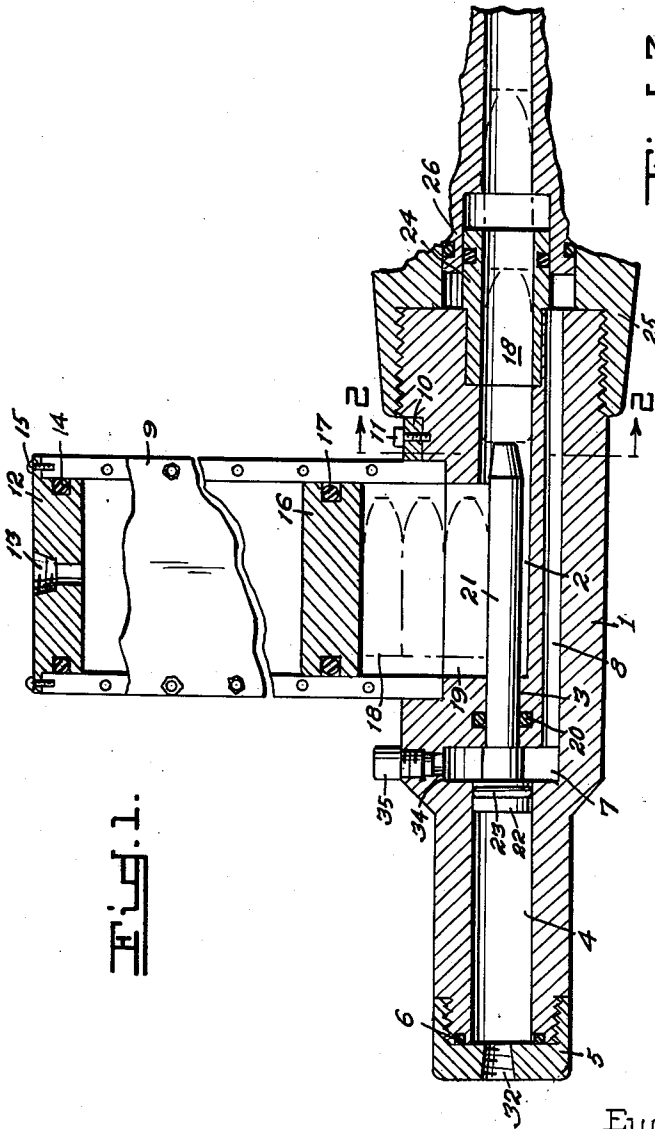


Fig. 1.

Fig. 3.

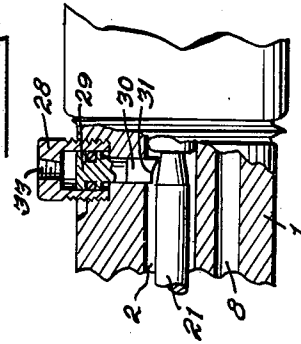
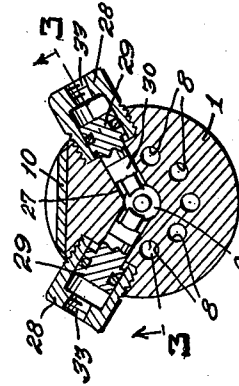


Fig. 2.



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PROJECTILE TRANSFER MECHANISM

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5 Claims. (Cl. 89—33)

This invention relates to projectile transfer mechanism and more specifically to a projectile transfer mechanism for guns capable of very high rates of fire and employing a fluid actuated feed plunger.

Briefly, our invention comprises a magazine for holding a stack of projectiles, the magazine being mounted upon a tube into which the projectiles are fed. The projectiles are fed from the magazine into the tube by a reciprocating plunger which is moved in the feed direction by gas pressure and in the retracting direction by liquid pressure generated by operation of the gun. The tube into which the projectiles are fed is subject to gas pressure from the gun and gates are provided to prevent retrograde movement of the projectiles.

An object of the invention is to provide a projectile feed mechanism having a fluid operated reciprocating feed plunger.

Another object of the invention is to provide a projectile feed mechanism having a feed plunger which is operated in one direction by gas pressure and in the opposite direction by liquid pressure.

Yet another object of the invention is to provide a projectile feeder having biased plungers in the feed path to prevent retrograde movement.

Still another object of the invention is to provide a projectile feeder having a magazine and a gas pressure operated follower for feeding the projectiles along the magazine.

These and other objects will become more apparent when reference is had to the following detailed description and drawing in which:

FIGURE 1 is a longitudinal sectional view of the projectile feed device showing the magazine, feed plunger and feed tube;

FIGURE 2 is a cross-sectional view taken on the line 2—2 of FIGURE 1 looking in the direction of the arrows; and

FIGURE 3 is a cross-sectional view taken on the line 3—3 of FIGURE 2.

With reference to the drawing and particularly to FIGURE 1, the projectile feed mechanism is provided with a housing or body 1 having the longitudinal feed passage 2 therein. Aligned and coaxial with the feed passage 2 are the bore 3 and counterbore 4. The end of the counterbored portion of the body is threaded and receives cap 5 which is provided with central passage 32. O-ring seal 6 is disposed between the body and the cap. Intermediate the bore 3 and counterbore 4 the body is provided with the chamber 7 which communicates with longitudinal channels 8.

Received in the upper side of the body 1 and suitably clamped thereto is the fluid tight projectile magazine 9. The magazine may be clamped to the body by means of the plate 10 held in position by bolt 11. The top end of the magazine is sealed off by means of closure 12 having central passage 13 and connected to the magazine by means of bolts 15. The O-ring seal 14 is received between the closure 12 and magazine 9. Slidably received within the magazine is the weighted follower 16 which rests upon projectiles 18 carried by the magazine. The O-ring seal 17 forms a fluid tight connection between the magazine and follower. The body 1 is provided with

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opening 19 which provides communication between the magazine 9 and feed passage 2.

Slidably received within the bore 3 and sealed with respect thereto by O-ring seal 20 is the reciprocable feed plunger 21. The feed plunger carries at its rearward end the piston 22 which is slidably received in the counterbore 4 and sealed with respect thereto by O-ring 23.

Connected to the front end of body 1 is the adaptor 24 which has a central passageway which forms a continuation of feed passage 2. The adaptor is made separate from the body for ease of manufacture only and could be made integral therewith. The body 1 is connected to the rear end of the gun indicated fragmentarily at 25. Part of the operating mechanism of the gun is the piston 26 which reciprocates each time the gun is fired and is slidable on the adaptor 24.

FIGURES 2 and 3 illustrate the manner in which retrograde movement of the projectiles 18 in feed passage 2 is prevented. The body 1 is provided with a plurality of radial passages 27 which communicate with feed passage 2 and with the cup shaped housings 28. Slidably received within the housings 28 are the pistons 29 which carry the integral plungers 30. These plungers are bevelled as at 31 so as to be forced upwardly when a projectile is being fed by the feed plunger 21. Compressible gas is provided above the pistons 29 so as to be compressed when the plungers 30 move upward. This gas biases the plungers into the channel 2 after passage of the projectile and prevent backward movement of the projectile in the channel 2.

In the operation of the feed mechanism, gas pressure is supplied to the body counterbore 4 through passage 32, to the magazine 9 through passage 13 and to the housings 28 through passages 33. It will be noted that these spaces may be charged with gas pressure and sealed off or continuously connected to a source of gas supply such as a bottle. Liquid is supplied through a filler opening 34 to completely fill the space 7, channels 8 and the space in front of piston 26 after which the sealing cap 35 is applied. The feed device is now ready for operation.

Upon firing of the gun the operating mechanism, not shown, moves the piston 26 rearwardly driving the piston 22 of the feed plunger 21 rearwardly by means of the liquid column trapped between the piston 26 and body 1. The pressure built up by piston 26 is greater than the gas pressure in counterbore 4. When the feed plunger 21 has been retracted the weight of the follower 16 and the gas pressure acting thereon in the magazine 9 force the bottom projectile from the stack into the feed channel 2. In the cycle of operation of the gun the actuating force on the piston 26 is now relieved and the gas pressure in counterbore 4 forces the plunger 21 forward to force the projectile forwardly in feed passage 2. At the same time the liquid column forces the piston 26 forward. When the projectile is fed forward it cams the plungers 30 outwardly until the projectile clears the plungers. At this time gas pressure in the housings 28 forces the pistons 29 down so that the plungers seat behind the projectile and prevent backward movement thereof.

While the feed mechanism has been described in the particular environment of feeding projectiles to a gun it will be obvious that the mechanism finds utility in other applications. For example, it could be used to feed blanks to a machine tool or to feed articles in a packaging machine, etc. In such a case the piston 26 could be mechanically operated by any suitable linkage or timing mechanism.

While we have shown and described but one specific embodiment of our invention it will be apparent that various modifications in construction and arrangement may

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be made without departing from the scope of the invention as defined in the appended claims.

We claim:

1. A projectile feed mechanism comprising a housing attached to the rear end of a gun and provided with a projectile feed passage, a magazine connected to said housing and communicating with said feed passage, said housing having a bore aligned with said feed passage, a feed plunger reciprocable in said feed passage, a first piston fixed to said plunger and slidable in said bore, means to admit gas pressure to one side of said piston, a second piston carried by the gun and movable in response to operation thereof, said housing having liquid containing passage means providing communication between the other side of said first piston and one side of said second piston.

2. A projectile feed mechanism as defined in claim 1 in which said housing is provided with at least one bore intersecting said feed passage forward of said magazine, and a plunger slidable in said bore and biased into said feed passage, said plunger having a bevelled end face so as to be cammed outwardly by forward movement of a projectile.

3. A projectile feed mechanism as defined in claim 1 in which said magazine is fluid tight, a follower slidable in

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and sealingly engaged with said magazine and means to admit gas pressure to said magazine above said follower.

4. An article feed mechanism comprising a body having an article feed passage and an aligned bore therein, a magazine connected to said body and communicating with said feed passage, a feed plunger reciprocable in said feed passage, a piston slidable in said bore and connected to said feed plunger, a second piston slidable in said body, said body being provided with a passage affording communication between said second piston and one side of said first piston, said last named passage containing a liquid medium such that movement of said second piston causes movement of said first piston, and means to admit gas pressure to the other side of said first piston.

5. An article feed mechanism as defined in claim 4 in which said second piston is annular and surrounds said feed passage.

References Cited in the file of this patent

UNITED STATES PATENTS

1,521,324	Revelli	Dec. 30, 1924
2,479,396	Nelson	Aug. 16, 1949
2,824,497	Bond et al.	Feb. 25, 1958
3,028,996	Ellett	Apr. 10, 1962
3,029,707	Christiansson	Apr. 17, 1962