

Sept. 29, 1931.

B. P. JOYCE

1,825,233

FLUID BRAKE MECHANISM

Filed June 16, 1930

Fig. 1-

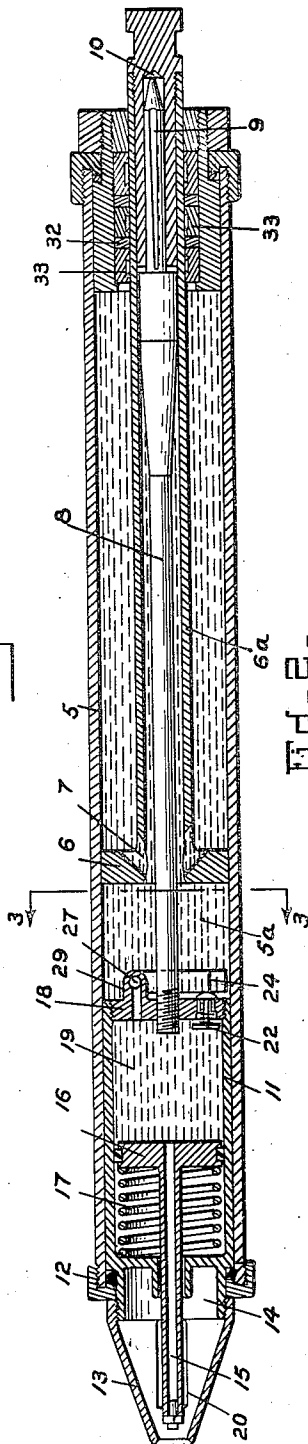


Fig. 2-

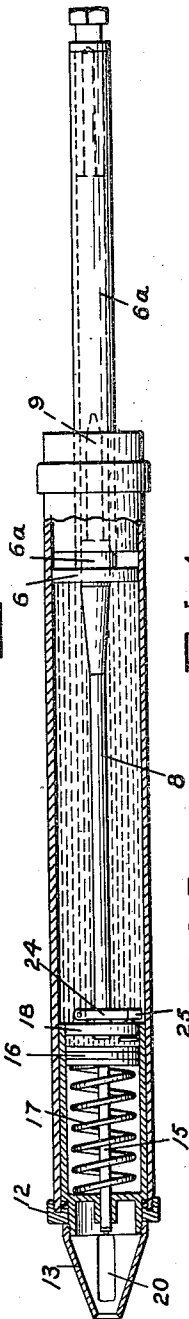


Fig. 3-

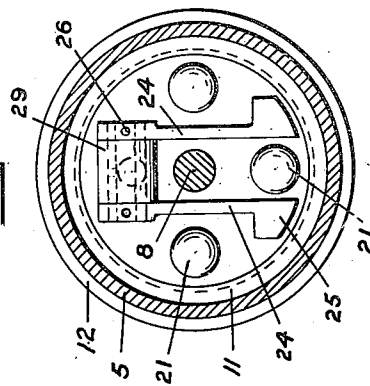
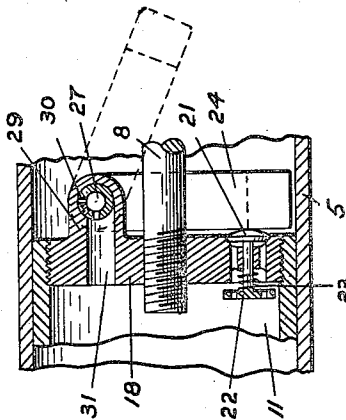


Fig. 4-



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FLUID BRAKE MECHANISM

Application filed June 16, 1930. Serial No. 461,517.

(GRANTED UNDER THE ACT OF MARCH 3, 1883, AS AMENDED APRIL 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

5 This invention relates to a fluid brake mechanism for guns.

In associating a spear type of counter-recoil buffer with a recoil mechanism, the braking action is effective only during the final portion of the counterrecoil stroke. Where a buffer is associated with a recuperator mechanism which is in communication with a recoil mechanism the braking action may be effective during the entire counter-recoil stroke.

15 The purpose of this invention is to associate a buffer of the continually acting type with a recoil mechanism, the space occasioned by withdrawal of the recoil piston being utilized to receive a fluid from a supplementary expansion chamber, which fluid is throttled upon the counterrecoil stroke of the piston.

25 With the foregoing and other objects in view, the invention resides in the novel arrangement and combination of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

A practical embodiment of the invention is illustrated in the accompanying drawings, wherein:

Fig. 1 is a longitudinal sectional view of the improved recoil mechanism showing the position of the parts when in battery;

Fig. 2 is a similar view showing the parts in position of full recoil;

Fig. 3 is a sectional view on the line 3—3 of Fig. 1; and

Fig. 4 is a fragmentary longitudinal sectional view through the diaphragm.

45 Referring to the drawings by numerals of reference:

50 There is shown a brake cylinder 5 in which is reciprocally mounted a brake piston 6 having the usual hollow piston rod 6a and the ports 7 in its head. The piston rod

is attached to the gun for movement therewith in recoil and counterrecoil. A fixed throttling bar 8 inserted in the hollow piston rod terminates in a reduced spear head 9 fitting in a buffer chamber 10 in the outer end of the piston rod.

The end of the cylinder 5 opposite the piston is closed by a short length cylinder 11 held against withdrawal by means of a ring 12 threaded to the exterior of the cylinder 5 and maintained against inward movement by means of a cap 13 threaded to its extremity and abutting the ring 12. The outer end 14 of the cylinder 11 is centrally apertured to accommodate the stem 15 of a plunger 16 within the cylinder and normally urged by a spring 17 towards the inner end 18. The cylinder 11 thus provides an expansion chamber 19, the position of the movable end constituted by the plunger being indicatable by observing the stem 15 through an aperture 20 in the cap 13.

The inner end wall 18 of the cylinder 11 forms a diaphragm separating the brake chamber 5a and the expansion chamber 19 and serves to anchor the throttling bar 8. It is spaced from the head of the piston 6 when the latter is fully forward in position of battery. The end 18 carries one or more one-way valves 21 opening into the brake chamber 5a and having an apertured disc 22 on its stem for engaging the end wall 18 to prevent undue compression of the valve spring 23.

The end wall 18 also carries a gravity actuated valve of the general type disclosed in my Patent 1,582,759 and is preferably disposed in the brake chamber 5a. In the present case a pair of spaced arms 24 having weights 25 on their lower extremity are secured by means of pins 26 to a hollow pivot 27.

This pivot is journaled in a projecting lug 29 on the end 18 and is provided with a number of radial ports 30 at least one of which is always in communication with a duct 31 leading from the pivot to the chamber 19 irrespective of the inclination of the weighted arm. As shown in Fig. 3, the

spaced arms clear the throttling bar 8 and the valves 21.

The brake chamber 5a and the expansion chamber 19 are filled with a fluid, preferably oil, which is admitted through the hollow stem 15 of the plunger 16 and maintained under pressure by the plunger.

When the gun is fired and moves in recoil, it retracts the piston 6 and the fluid is obliged to pass from one side of the piston head to the other being conducted through the ports 7 whose outlet is varied by the throttling bar 8. The throttling of the oil provides a brake for checking the movement of the gun in recoil. A small amount of the fluid is diverted to the rear of the throttling bar and collects in the chamber 10 at the conclusion of the counterrecoil stroke to oppose entry of the spear head 9. The action heretofore described is typical of this class of recoil mechanisms.

The withdrawal of the piston rod from the brake chamber 5a increases the volume thereof by a corresponding amount less the volume of oil which is delivered to the buffer chamber 10. This increase in the volume of the recoil cylinder 5 is attended by a reduction in pressure and the plunger 16 under the action of its spring and atmospheric pressure comes into play to force fluid from the expansion chamber 19 through the valves 21 into the brake chamber to compensate for displacement of the piston rod.

During the countercoil movement of the gun the piston 6 moves forwardly in the brake chamber 5 and must displace the fluid admitted from the expansion chamber. The only escape provided for this surplus volume of fluid is by way of the hollow pivot 27, the radial ports 30 provided therein, and the duct 31. The throttling of this fluid in its return to the expansion chamber provides a brake acting continuously and uniformly throughout the countercoil stroke to check the momentum of the moving parts.

As the gun carrying the recoil mechanism is elevated the arms 24 automatically move to different positions and more of the radial ports 30 are brought into register with the duct 31, thus permitting the fluid to return to the expansion chamber at a greater rate and compensating for the greater force required to be exerted by the recuperator mechanism to restore the gun to battery.

As seen in Fig. 1 when the recoil mechanism is horizontal or at zero elevation, at least one of the radial ports 30 will be in communication with the duct 31, thereby permitting an equalization of pressures in the brake chamber and expansion chamber at all times.

The packing units 32 and the retainers 33 preferred in the present arrangement are disclosed in detail in my prior Patent 1,584,700, and Reissue 16,978.

I claim:

1. A fluid brake mechanism embodying a brake cylinder, a brake piston having ports, a throttling bar associated with the piston, a closed cylinder providing a closure for one end of the brake cylinder, the inner end of the closure cylinder provided with a throttling orifice establishing communication with the brake cylinder, gravity actuated means for regulating the throttling orifice, a valved outlet in said inner end leading to the brake cylinder, and a plunger in the closure cylinder.

2. A fluid brake mechanism embodying a brake cylinder, a brake piston having ports, a throttling bar associated with the piston, a closed cylinder providing a closure for one end of the brake cylinder, the inner end of the closure cylinder provided with a variable throttling orifice establishing communication with the brake cylinder, a valved outlet in said inner end leading to the brake cylinder, and a plunger in the closure cylinder.

3. A fluid brake mechanism embodying a brake cylinder, a brake piston reciprocal therein, a closure for the cylinder providing an expansion chamber, the inner end of said closure provided with a variable throttling orifice establishing communication with the brake cylinder, and a valved outlet in said inner end leading to the brake cylinder, and a plunger in the expansion chamber.

4. A fluid brake mechanism embodying a brake cylinder, a brake piston reciprocal therein, a closure for the cylinder providing a reservoir, a valved outlet from the reservoir to the brake cylinder, a throttled inlet to the reservoir from the brake cylinder, and a plunger in the reservoir.

5. A fluid brake mechanism embodying a brake cylinder, a diaphragm in the cylinder defining a brake chamber and an auxiliary chamber, a throttling orifice in the diaphragm, means for regulating the throttling orifice, a valved outlet in the diaphragm leading to the brake cylinder, a brake piston in the brake chamber, and a plunger in the auxiliary chamber.

6. A fluid brake mechanism embodying a brake cylinder, a diaphragm in the cylinder defining a brake chamber and an auxiliary chamber, a throttling orifice in the diaphragm, a valved outlet in the diaphragm leading to the brake cylinder, a brake piston in the brake chamber, and a plunger in the auxiliary chamber.

7. A fluid brake mechanism embodying a brake cylinder, a brake piston therein, an auxiliary chamber having a nonreturn outlet to the brake cylinder, a throttled inlet for the auxiliary chamber, means for regulating the throttled inlet, and a plunger in the auxiliary chamber.

8. A fluid brake mechanism embodying a

brake cylinder, a brake piston therein, an auxiliary chamber having a nonreturn outlet to the brake cylinder, a throttled inlet for the auxiliary chamber, and a plunger
5 in the auxiliary chamber.

9. A fluid brake mechanism embodying a brake cylinder, a brake piston therein, an auxiliary chamber having a nonreturn outlet to the brake cylinder, a throttled path
10 of communication between the auxiliary chamber and brake cylinder, and a plunger in the auxiliary chamber.

10. A fluid brake mechanism embodying a brake cylinder, a brake piston therein,
15 means including a one-way passage for supplying a fluid to the brake cylinder to compensate for displacement of the piston during its back stroke, and means for throttling the supplied fluid out of the brake cylinder
20 on the forward stroke of the piston.

11. In a valve mechanism, a member provided with a passage, a hollow pivot provided with ports affording communication with the passage and a gravity actuated
25 member carried by the pivot.

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