

PATENT SPECIFICATION

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(54) AN AUTOMATIC FIRING WEAPON

(71) We, WERKZEUGMASCHIN-
ENFABRIK OERLIKON-BUHRLE AG,
a company organised and existing under the
laws of Switzerland, of Birchstrasse 155,
CH—8050 Zurich, Switzerland do hereby
declare the invention, for which we pray that
a patent may be granted to us, and the
method by which it is to be performed, to be
particularly described in and by the
following statement:—

This invention relates to an automatic
firing weapon having means for damping
forward and return movement of a weapon
housing and a weapon barrel.

According to the present invention there
is provided an automatic firing weapon
comprising a weapon mount, a weapon
housing and a weapon barrel, the weapon
barrel being slidably displaceable in relation
to the weapon housing and the weapon
housing being slidably displaceable with
respect to the weapon having a damping
mechanism arranged externally of the
weapon housing and including a sleeve
member connected to the weapon mount
for slidable movement relative thereto and
which is secured to the weapon housing for
movement therewith, a first coil spring
being arranged for damping said slidable
movement of the sleeve relative to the
weapon mount, the sleeve also being
connected to the weapon barrel for slidable
movement relative thereto, and a second
coil spring being arranged for damping said
slidable movement of the sleeve relative to
the weapon barrel, the first and second
springs being in axial alignment.

The invention will be better understood
and objects other than those set forth above,
will become apparent when consideration is
given to the following detailed description
thereof. Such description makes reference
to the annexed drawings illustrating two
exemplary embodiments of the invention,
and wherein:

Figure 1 is a front view of a firing weapon
with a recoil or return motion device ac-
cording to a first exemplary embodiment of

the invention and shown perspective view;

Figure 2 is a cross-sectional view, taken
substantially along line II—II of Figure 1;

Figure 3 is a cross-section view, taken
substantially along line III—III of Figure 2;
and

Figure 4 is a sectional view corresponding
to the showing of Figure 2 of a further
exemplary embodiment of recoil
mechanism.

Describing now the drawings, according
to the showing of Figure 1 the firing weapon
encompasses a housing 1 and a weapon or
gun barrel 2. The housing 1 is displaceably
mounted with regard to a weapon mount
balance or rocker 35. In Figure 1 only part of
the weapon or gun mount balance 35 has
been shown in order to preserve clarity in
illustration. The barrel 2 is displaceably
mounted in sleeve-shaped portion 3 of the
weapon or gun housing 1. A yoke is fixedly
seated forwardly of the housing 1 at the
barrel 2. A yoke 4 possesses a pair of
projections 5 and the housing 1 two pairs of
projections 6. The projections 5 and 6
extend towards the outside to both sides of
the weapon or gun barrel 2 and the housing
1. The projections 5 and the pair of
projections 6 situated closer thereto possess
coaxial bores 7 and 8 which are directed
substantially parallel to the axis of the gun
barrel 2, as best seen by referring to Figure
2. Machined e.g. by milling at the projec-
tions 6 are surfaces 9 which are parallel to
the longitudinal or lengthwise extending
central plane of the housing 1 and surfaces
10 which are directed perpendicular to these
surfaces 9. The projections 6 of the housing
1 are guided in rails 47, which in the showing
of Figure 1 have been conveniently shown at
one side of the weapon and connected with
a part of the weapon mount balance 35
which has not been particularly shown in the
drawings.

According to the showing of Figure 2 a
bushing 11 is inserted in the bore 8 of each
projection 6 of the housing 1. This bushing
11 is positionally secured by a flange 12 and

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a counter nut member 13 which is threaded on to the bushing 11 as shown. In the bore 14 of the bushing 11 and the bore 7 of the associated projection 5 at the yoke 4 there are suitably machined coaxial grooves or recesses 15. The grooves 15 are open towards the front ends by three sector-shaped cutouts or recesses 16, as best seen by referring to Figure 3. In the bore 7 of each yoke projection 5 there is mounted a sleeve 17. This sleeve 17 is secured by bayonet joints e.g. by bayonet tabs or projections 18 of the sleeve 17, which are introduced via the cutouts or recesses 16 into the grooves 15. The sleeve 17 extends away from the yoke 4 towards the front in the firing direction S and possesses two bore portions 19, 20. The diameter of the forward bore portion 19 of sleeve 17 is somewhat larger than that of the rear bore portion 20. A retaining or clamping nut 21 is threaded onto the sleeve 17 and bears by means of a shoulder 22 at the end surface thereof. The nut member 21 possesses a bore 48, the diameter of which is smaller than the diameter of the bore portion 19.

In the bore 14 of the bushing 11 there is mounted a sleeve 23 with its sleeve part 23b, which is secured by bayonet joints e.g. bayonet projections or tabs 18 of the sleeve 23 which engage with the grooves 15. The sleeve 23 extends into the sleeve 17 and is displaceably mounted in its bore portion 20. A part 23a of the sleeve 23, which is located within the bore portion 19 of the sleeve 17, possesses an external diameter which is smaller than the diameter of the bore portion 19. A support disc 24 is held in contact with the end surface of the sleeve portion 23a by means of the head 25 of the illustrated screw (Figure 2) which is threaded into such sleeve portion 23a, as shown. The support disc 24 possesses a larger diameter than the outer diameter of the sleeve portion 23a.

The sleeve portion 23b is threadably connected with a further sleeve 31. The diameter of the bore of the sleeve portion 23b is larger than the bore diameter of the sleeve 31. A retaining nut member 32 is equipped with a central bore 33 is threaded onto the sleeve 31. The diameter of the bore 33 is smaller than the diameter of the bore of the sleeve 31. A rod 34 is arranged in the sleeves 23b, 31 coaxial thereto. A part 34a of rod 34 extends through the bore 33 out of the sleeve 31. This rod portion or part 34a is mounted at a part of the gun mount balance or rocker 35 and is fixedly connected therewith by a bolt 36. The diameter of the rod portion 34b which is located in the sleeve 31 is smaller than that of the rod portion 34a. The end of the rod portion 34b is displaceably supported upon two ring members 37 and 38 which are displaceably

mounted in the bore of the sleeve portion 23b. The cylindrical head 39 of a screw, which has not been particularly designated, threaded into the end of the rod portion 34b and supported at the end surface thereof possesses a diameter which is larger than the diameter of the rod portion 34b.

A first coil spring is subdivided into two spring element sets or packages 40, 42. The one set of spring elements 40 is arranged between both rings or ring members 37 and 38 and the other set or package of spring elements 42 is arranged between the ring member 37 and ring member 43, which bears against a shoulder 44 of the rod 34. The sets of spring elements 40, 42 and the ring member 37 are displaceable upon the rod 34. A shoulder 45 of the retaining nut member 32 bears against the ring 43 and a shoulder 46 of the sleeve 23 bears against the ring or ring member 38, thereby fixing the rest position of the housing 1 with regard to the mount balance or rocker 35.

Thus upon return movement of the weapon housing both sets of spring elements are compressed whereas during forward movement only one of the sets of spring elements is compressed. By means of the spring element set 40 the ring 37 is pressed against the end surface 41 of the sleeve 31 and the ring 38 against the screw head 39.

A ring member 26, a second coil spring 27 and a ring member 28 are displaceably arranged behind one another at the sleeve portion or part 23a. Under the pre-bias force of the second coil spring 27 the ring or ring member 26 bears against a shoulder 29 of the sleeve 23 and the ring member 28 bears against the supporting disc 24. Shoulder 30 of the sleeve 17 bears against the ring member 26 and shoulder 22 of the retaining nut member 21 bears against the ring member 28, thereby fixing the rest position of the barrel 2 with regard to the housing 1. The coil springs may be prestressed prior to assembly if desired.

Having had the benefit of the foregoing description of the constructions of the apparatus of this development its mode of operation will now be described and is as follows:

Under the action of the recoil force, which during firing of the weapon loads the barrel 2, the latter together with the yoke 4, the sleeve 17 and the retaining nut member 21 carries out a movement which is opposite to the direction of firing S with respect to the weapon housing 1.

Consequently, the yoke 4 approaches the weapon housing 1, and the sleeve 17 is thus displaced upon the sleeve 23 and the second coil spring 27 is compressed together. By means of the second coil spring 27 the recoil force is transmitted to the sleeve 23 and the weapon housing 1 which is connected

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therewith and such components likewise carry out a movement which is directed opposite to the direction of firing S with respect to the stationary rod 34. During this motion the tandemly arranged sets of spring elements 40, 42 of the first coil spring are compressed together. Since the line of action of the reaction force which is exerted by such first coil spring 40, 42 upon the sleeve 23 coincides with the line of action of the forces of the second coil spring 27, the weapon housing 1 is therefore not additionally loaded by bending moments due to the recoil of the barrel 2. Since furthermore the force of the second coil spring 27 is transmitted via the sleeve 23 directly to the first coil spring 40, 42, the weapon housing 1, during recoil or return motion of the barrel 2, is not loaded by compression forces.

In contrast to the arrangement according to Figures 1 and 2 in which the coil springs 27 and 40, 42 are tandemly arranged, i.e. behind one another, with the modified version of apparatus depicted in Figure 4, wherein the same reference characters have been generally used for the same or analogous components, the coil spring 40, 42 of the weapon housing 1 is arranged partially within the sleeve 17, in other words concentrically with regard to the coil spring 27 of the barrel 2. The advantage of this arrangement resides in the shorter constructional length with regard to that shown in Figures 1 and 2. However, the mode of operation of the apparatus according to this modified second exemplary embodiment is not different from that described above with regard to the exemplary embodiment.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto, but may be otherwise variously embodied and practiced within the scope of the following claims.

WHAT WE CLAIM IS:—

1. An automatic firing weapon comprising a weapon mount, a weapon housing, and a weapon barrel, the weapon barrel being slidably displaceable in relation to the weapon housing, and the weapon housing being slidably displaceable with respect to the weapon mount, the weapon having a damping mechanism arranged externally of the weapon housing and including a sleeve member connected to the weapon mount for slidable movement relative thereto and which is secured to the weapon housing for movement therewith, a first coil spring being arranged for damping said slidable movement of the sleeve relative to the

weapon mount, the sleeve also being connected to the weapon barrel for slidable movement relative thereto, and a second coil spring being arranged for damping said slidable movement of the sleeve relative to the weapon barrel, the first and second springs being in axial alignment.

2. A weapon according to Claim 1 in which the first and second coil springs are arranged one within the other.

3. A weapon according to Claims 1 or 2 in which the first and second coil springs are arranged one behind the other.

4. A weapon according to Claims 1, 2 or 3 wherein said sleeve member is connected to the weapon barrel via a second sleeve member which is fixedly connected to the weapon barrel for movement therewith, the first mentioned sleeve member and said second sleeve member being slidably interconnected with said second coil spring being interposed therebetween.

5. A weapon according to any of Claims 1 to 4 wherein said first mentioned sleeve member is connected to the weapon mount via a rod which is slidably received in the sleeve, the first coil spring being located between the first mentioned sleeve member and the rod, said first coil spring bearing with one end on the first mentioned sleeve member and with its other end on the rod.

6. A weapon according to Claim 4 wherein the first mentioned and the second sleeve members are each detachably connected by releasable means to the weapon housing and to the weapon barrel respectively.

7. A weapon according to Claims 4 or 6 wherein each of the first mentioned and second sleeve members possess a shoulder which is directed towards the other shoulder, the shoulders being arranged in spaced relationship from one another, said second coil spring being pre-stressed between said shoulders.

8. A weapon according to Claim 5 wherein the first coil spring is sub-divided into two sets of spring elements between which sets of spring elements there is arranged a ring member in such a manner that upon return movement of the weapon housing both sets of spring elements are compressed, whereas during the forward movement only one set of the spring elements is compressed.

9. A weapon according to Claim 8 having two of said damping mechanisms arranged parallel to each other and being located on opposite sides of the weapon barrel.

10. A weapon according to Claim 9 wherein the two damping mechanisms are connected to the weapon barrel by a yoke.

11. An automatic weapon having means

therewith and such components likewise carry out a movement which is directed opposite to the direction of firing S with respect to the stationary rod 34. During this motion the tandemly arranged sets of spring elements 40, 42 of the first coil spring are compressed together. Since the line of action of the reaction force which is exerted by such first coil spring 40, 42 upon the sleeve 23 coincides with the line of action of the forces of the second coil spring 27, the weapon housing 1 is therefore not additionally loaded by bending moments due to the recoil of the barrel 2. Since furthermore the force of the second coil spring 27 is transmitted via the sleeve 23 directly to the first coil spring 40, 42, the weapon housing 1, during recoil or return motion of the barrel 2, is not loaded by compression forces.

In contrast to the arrangement according to Figures 1 and 2 in which the coil springs 27 and 40, 42 are tandemly arranged, i.e. behind one another, with the modified version of apparatus depicted in Figure 4, wherein the same reference characters have been generally used for the same or analogous components, the coil spring 40, 42 of the weapon housing 1 is arranged partially within the sleeve 17, in other words concentrically with regard to the coil spring 27 of the barrel 2. The advantage of this arrangement resides in the shorter constructional length with regard to that shown in Figures 1 and 2. However, the mode of operation of the apparatus according to this modified second exemplary embodiment is not different from that described above with regard to the exemplary embodiment.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto, but may be otherwise variously embodied and practiced within the scope of the following claims.

WHAT WE CLAIM IS:—

1. An automatic firing weapon comprising a weapon mount, a weapon housing, and a weapon barrel, the weapon barrel being slidably displaceable in relation to the weapon housing, and the weapon housing being slidably displaceable with respect to the weapon mount, the weapon having a damping mechanism arranged externally of the weapon housing and including a sleeve member connected to the weapon mount for slidable movement relative thereto and which is secured to the weapon housing for movement therewith, a first coil spring being arranged for damping said slidable movement of the sleeve relative to the

weapon mount, the sleeve also being connected to the weapon barrel for slidable movement relative thereto, and a second coil spring being arranged for damping said slidable movement of the sleeve relative to the weapon barrel, the first and second springs being in axial alignment.

2. A weapon according to Claim 1 in which the first and second coil springs are arranged one within the other.

3. A weapon according to Claims 1 or 2 in which the first and second coil springs are arranged one behind the other.

4. A weapon according to Claims 1, 2 or 3 wherein said sleeve member is connected to the weapon barrel via a second sleeve member which is fixedly connected to the weapon barrel for movement therewith, the first mentioned sleeve member and said second sleeve member being slidably interconnected with said second coil spring being interposed therebetween.

5. A weapon according to any of Claims 1 to 4 wherein said first mentioned sleeve member is connected to the weapon mount via a rod which is slidably received in the sleeve, the first coil spring being located between the first mentioned sleeve member and the rod, said first coil spring bearing with one end on the first mentioned sleeve member and with its other end on the rod.

6. A weapon according to Claim 4 wherein the first mentioned and the second sleeve members are each detachably connected by releasable means to the weapon housing and to the weapon barrel respectively.

7. A weapon according to Claims 4 or 6 wherein each of the first mentioned and second sleeve members possess a shoulder which is directed towards the other shoulder, the shoulders being arranged in spaced relationship from one another, said second coil spring being pre-stressed between said shoulders.

8. A weapon according to Claim 5 wherein the first coil spring is sub-divided into two sets of spring elements between which sets of spring elements there is arranged a ring member in such a manner that upon return movement of the weapon housing both sets of spring elements are compressed, whereas during the forward movement only one set of the spring elements is compressed.

9. A weapon according to Claim 8 having two of said damping mechanisms arranged parallel to each other and being located on opposite sides of the weapon barrel.

10. A weapon according to Claim 9 wherein the two damping mechanisms are connected to the weapon barrel by a yoke.

11. An automatic weapon having means



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for damping forward and return movements
of a weapon barrel and a weapon housing,
substantially as described and illustrated
herein with reference to Figures 1 to 3 or

Figures 1, 3 and 4 of the accompanying
drawings.

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