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(54) AUTOMATIC FIRE-ARMS

(71) We, WERKZEUGMASCHINENFABRIK 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 is concerned with an automatic fire-arm comprising a breech casing with a bore in which a gun barrel is mounted, and a breech body which is axially slidable in the breech casing and is provided with at least one catch element capable of interlocking the breech body with the breech casing, the catch element being supportable against a rest surface on an interlocking body inserted into the breech casing.

With a known fire-arm of this kind, the breech casing comprises holding grooves for the catch elements, the heavily stressed rest surfaces of these grooves not being constituted by the breech casing itself but on interlocking bodies designed as bolts made of high strength, wear resistant materials. These bolts are inserted into bores in the breech casing which extend skew relative to the perpendicular against the weapon axis. As a safrguard against twisting the bolts are provided with keys, and the bores are provided with corresponding keyways.

A breech casing which incorporates holding grooves and, above all, transverse bores with keyways for interlocking bodies must inevitably be considerably weakened as a result of making these arrangements. It is moreover known that the concentration of stresses induced into the casing by the back pressure of the cartridge case at the moment of firing can be very high in the area where the interlocking bolts are located, and that the breech casing is consequently in severe danger of breaking. It has therefore been necessary for certain dimensions in this critical area to be considerably increased; this measure, however, leads to a considerable increase in weight. The design for the breech casing is fairly complex. Apart from the usual openings for the accommodation of the gun barrel and the breech mechanism, the casing must include inside it the holding grooves and bores with keyways for the interlocking bodies referred to above. Since very high demands are made in respect of the precision of the interlocking mechanism, manufacture and assembly of the weapon are far from cheap. The manufacture of holding grooves will moreover only be problem-free when the breech casing is open on one side, or consists of two separate sections.

According to the invention there is provided an automatic fire-arm comprising a breech casing having a bore in which is fitted a gun barrel through a bayonet joint, a breech body slidably mounted in the casing and having a catch element, an interlocking body in the casing and being of sleeve form with a cut-out in a rear face thereof, the cut-out extending across the longitudinal axis of the fire-arm and defining a wall within the interlocking body which serves as a rest face for supporting said catch element, the outer diameter of the interlocking body being substantially equal to the bore diameter of the breech casing and the interlocking body being supported axially in position in the casing by abutment of a rear face thereof against a shoulder of the casing and by abutment of a forward face thereof with a face of the gun barrel.

A special advantage of this arrangement is that the interlocking body may be removed from the breech casing for exchange or cleaning, and re-inserted into it without difficulty.

Reference is now made to the accompanying drawings, in which:-

Figure 1 shows part of the fire-arm according to a first embodiment of the invention in a horizontal axial section, the breech body being shown in its firing or locked position;

Figure 2 corresponds to Figure 1 and shows the breech body in its released position;

Figure 3 is a section along the line III-III in Figure 1;

Figure 4 is a section along the line IV-IV in Figure 2;

Figure 5 presents the interlocking body in perspective; and

Figure 6 is a horizontal longitudinal section through part of the fire-arm according to a second embodiment, with the breech body in firing position.

According to Figures 1 and 2 the breech

casing 1 of an automatic fire-arm houses an axially displaceable breech body 23 which consists of a breech head 2 and a control member 3. The control member 3 is spring loaded; the spring 4 being indicated schematically by chain-dotted lines. The breech head 2 contains two catch elements 5, pivoted in a known manner which is not shown in detail, and each consisting of a front part 5a and a rear part 5b. The breech casing 1 is provided with a cylindrical bore 7 into which are inserted a barrel 8 and an interlocking body 6. A bayonet connection 9 locks the casing 1 in a known manner with the barrel 8. A reduced diameter end section 10 of the barrel 8 projects into the sleeve-shaped extension 11 of the interlocking body 6. Its end face 12 rests against a collar 13 of the interlocking body 6. This interlocking body 6 is thus supported in the axial direction, on one end at the barrel 8 and on the other end at the breech casing 1, where its rear end face 14 rests against a collar 15 in the casing. A lever 18 is pivoted at the casing 1. It is loaded by a spring 16 and extends into a radial groove 17 in the sleeve-shaped extension 11 of the interlocking body 6 thus ensuring that the radial position of the externally cylindrical body 6 is anchored relative to the breech casing 1.

There is a cartridge 20 inside the barrel 8. A firing pin 21 is mounted inside the control member 3 (Figure 1).

As shown in Figure 5, the rear end of the interlocking body 6, which is co-axial with the barrel 8, is provided with a continuous, symmetrical cut-out 25 which extends across its longitudinal axis. The inner side walls of this cut-out 25 constitute holding grooves 26 for the catch elements 5, the rest surfaces 27 and 28 of the grooves 26 including between them an obtuse angle as shown in Figures 1 and 2.

The interlocking body 6 also comprises a continuous internal passage 30 of cruciform cross-section, which extends in the longitudinal direction (Figures 3 and 5) and is provided with guide faces 31 and 32 (Figures 2, 3 and 5) for the similarly cruciform front part 2*a* of the breech head 2 (Figures 1, 2 and 3). The guide faces 31 and 32 on the interlocking body 6 are projected in the axial direction by the guide faces 33 and 34 in the breech casing 1 (Figure 2).

As shown in Figure 4, the rear parts 5*b* of the catch elements 5 which are not as wide as the front parts 5*a*, rest against surfaces 36 and 37 on the breech head 2 through which their movements are controlled when the catch element 5 is swivelled. The front parts 5*a* support themselves at the bottom of recesses 35 (Figure 4 and Figure 2) in the breech head 2.

As shown in Figure 1, the front parts 5*a* of the catch elements 5 are provided with interlocking surfaces 40, and the rear parts 5*b* are provided with impact surfaces 41. The control member 3 is provided with supporting surfaces 42 and engaging-faces 43, which interact with the catch elements 5.

The interlocking element used with the second embodiment of the automatic fire-arm, which is shown in Figure 6, has been given the reference number 46. In contrast to the first embodiment, this interlocking body 46 is provided with stop surfaces 47. In the firing position shown in the drawing, the corresponding impact areas 48 on the breech head are in full surface contact with these stop surfaces 47.

The interlocking bodies 6, 46, consist of a high-strength wear-resistant material.

The functions of the assembly are as follows, when the locking body 23 assumes the position according to Figure 1 the firing pin 21 fires the cartridge 20, after which a projectile moves through the barrel 8, the gas pressure of the charge which is present in the empty cartridge case being transmitted to the rest surfaces 27 of the interlocking body 6 via the breech head 2 and the catch elements 5. The angle which these rest faces 27 form with the axis of the body 6 and consequently with the weapon axis, is normally chosen with a view to ensuring that the rest surfaces 27 cannot have a self-locking effect on the catch elements 5. It is for this reason that the catch elements 5 are pressed inwards by the effect of the force which loads them, so that they must support themselves against the control member 3, abutting against its engaging-areas 43.

As soon as the projectile passes beyond a gas outlet point (not illustrated) in the barrel 8, the control member 3 is caused to move towards the rear in a known manner which is not explained in detail.

When this movement is completed the catch elements 5 are no longer in surface contact with the engaging-areas 43 on the control member 3, and are swivelled inwards, their locking surfaces 40 losing contact with the rest surfaces 27, and the impact surfaces 41 on the rear parts 5*b* of the catch elements 5 abutting against the supporting areas of the control member 3 which are inclined relative to the barrel axis (Figure 2). In this position the breech body 23 is released and it is pushed backwards by the force of the gases residual in the barrel which may reach the breech body via the empty cartridge case. The front part 2*a* of the breech head 2 is thereby controlled by the guide faces 31 and 32 of the cruciform passage 30, while the rear part 2*b* already slides along the guide faces 33 and 34 in the breech casing 1.

When the breech body 23, after reversal of its movement at the rear end, advances once more towards the front, a cartridge is inserted into the barrel 8. The front part 2*a* of the breech head 2 advances once more through the passage 30 of the interlocking body 6 until it is stopped by the impact at the rear end face 12 of the barrel 8. The control member 2, however, which is loaded by the spring 4 in the breech head 2, continues moving forward and presses thereby the catch elements 5 outwards into the

holding grooves 26 against the rest surfaces 27 and 28, so that the breech body 23 is once more locked with the interlocking body 6 and consequently with the casing 1.

Since the interlocking bodies consist of a high-strength, wear-resistant material, the bodies 46 of the second embodiment are advantageously provided with additional stop surface 47 for the breech head. With this arrangement the impact with the breech head 2 no longer occurs at the rear end face 12 of the barrel 8, but it is alleviated by the locking element 46.

The co-axial arrangement of barrel and interlocking body (6 or 46 respectively) which enables the holding grooves 26 to form a continuous surface with the rest surfaces 27 and 28, simplifies the form of the breech casing considerably; this is favourable for its manufacutre as well as with regard to savings in weight. The breech casing does not include any transverse recesses which, apart from creating manufacturing difficulties, might cause the housing to break and therefore require certain dimensions to be increased.

The greatest advantage seems to be due to the cylindrical form of the interlocking bodies 6 or 46 respectively, because this enables them to be mounted in the same bore 7 which also accommodates the barrel 8. The forces may therefore be transmitted through a closed breech casing. It would of course be feasible for the outer walls of the interlocking bodies to be designed differently and thus even to eliminate the lever 18 and radial groove 17 which are used in order to prevent torsional displacements of the cylindrical units. However, the advantages of such an arrangement would seem to be limited to breech casings which are open on one side or to sectioned casings.

The sleeve-shaped extension 11 of the interlocking body 6 is optional. It merely serves as a means to improve the control of movement inside the bore 7, and permits providing the radial groove 17 at a position outside the heavily stressed zone where the holding grroves 26 are located. The lever 18 and the radial groove 17 could of course be replaced by any known alternative means by which to prevent the unit from twisting.

A feature which simplifies the design of the fire-arm according to the invention is that it contains only one single interlocking body which, moreover, can be replaced without difficulty.

WHAT WE CLAIM IS:-

1. An automatic fire-arm comprising a breech casing having a bore in which is fitted a gun barrel through a bayonet joint, a breech body slidably mounted in the casing and having a catch element, an interlocking body in the casing and being of sleeve form with a cut-out in a rear face thereof, the cut-out extending across the longitudinal axis of the fire-arm and defining a wall within the interlocking body which serves as a rest face for supporting said catch element, the outer diameter of the interlocking body being substantially equal to the bore diameter of the breech casing and the interlocking body being supported axially in position in the casing by abutment of a rear face thereof against a shoulder of the casing and by abutment of a forward face thereof with a face of the gun barrel.

2. A fire-arm according to Claim 1, wherein two catch elements are supported on rest faces defined by opposite walls within the cut-out.

3. A fire-arm according to Claim 1 or 2, wherein the interlocking body comprises a radial groove into which extends a spring loaded lever which is pivoted on the breech casing.

4. A fire-arm according to any preceding Claim, wherein the interlocking body is provided with stop surfaces for the breech body.

5. An automatic fire-arm, substantially as described with reference to the accompanying drawings.

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