ARTILLERY PROJECTILE WITH INTERCHANGEABLE PAYLOAD

The invention concerns a carrier as set forth in the classifying portion of claim 1.

Such a carrier is known from DE 38 08 796 A1 as a distributor device for the launch and delivery of sub-projectiles. That distributor device is essentially a case of square cross-section which at its front end is designed aerodynamically as a head portion and which in a rearward body portion is provided with a steering mechanism and optionally a drive but which is also designed for launching from under an aircraft. The internal structure of the distributor device, which is substantially T-shaped in cross-section, can be equipped for delivery of the sub-projectiles in different directions, depending on the structural load-bearing capability thereof. However, such a distributor device still does not afford the desirable variety in terms of accurately targeted launching of different submunitions over great distances by means of autonomous launch systems which can be used for very different submunitions.

That applies in a corresponding manner to the warhead known from DE 199 17 189 A1 with submunitions which are ejected simultaneously by a central ejection system in mutually opposite directions, that is to say through base and head openings.

The cartridge with submunitions, which is intended for being fired from smooth-bore canons, in accordance with DE 199 44 379 A1, is provided with a cartridge case which projects beyond the tail of the cartridge into the central region thereof. In the region in which the collar flange bears against the cartridge casing, the tail of the cartridge carries a cup, through the apertured bottom of which the propellent gases can pass out of the cartridge case into a hollow space behind the base of the cartridge in order to withdraw the cup rearwardly from the cartridge, as a consequence of expansion. In that way the steering mechanism wings which are initially rolled in along the wall of the cartridge are released for deployment, for which purpose as will be appreciated the cartridge case must already have been released from the cartridge body. That however can already happen in the barrel so that the deploying wings impede launch and can result in irregular external ballistics of the cartridge.

It is known from DE 33 34 023 A1 as such to provide a projectile body which is to be launched by means of rapid-fire weapons and high-performance machine guns, in an annular groove around the projectile body, with a plastic guide band which, opposite its radially projecting head surface, has an enlarged base in order better to be able to manage and control

the temperature loading which occurs at a high cadence rate. Problems in terms of accurately targeted launch of different payloads over increased distances by means of standardised carrier systems are no closer to being solved on the basis of such considerations.

The present invention in contrast involves more varied utility of a launch carrier in the manner of the artillery rocket system which has been introduced. That system is know as the MLRS 1/2. The continuous rocket casing thereof can be equipped with canisters from the tail while it is still open, behind the ogive which is fitted with a time fuse. The canisters in turn are equipped with distribution units for the ejection of different armour-piercing active bodies such as for example bomblets or armour mines. Behind that axial stack of canisters the rocket is then equipped with its motor, the housing of which is equipped in the tail region with control rudders which can be deployed and which are curved parallel to the system axis. The flexibility of such a system is limited however because the rocket casing is in one piece from the ogive as far as the separation location for the connection of the discardable rocket motor. The steering properties of that artillery rocket are also only moderately good because, with a motor which is activated only for a short time after leaving the launch barrel, the rocket experiences a high level of acceleration into a comparatively flat trajectory. Termination of the mission, which is purely time-dependent, by way of the time fuse in the ogive does not allow the expectation of pin-point accuracy in target acquisition so that, when the time fuse responds with explosive discarding of the motor which has then long been burnt out, only scattering active bodies are to be deployed in a meaningful manner.

An arrangement comparable to the above-described arrangement is the carrier described in DE 38 08 796 A1 for being fitted with various kinds of sub-projectiles to be distributed, between a head portion forming the front end of the carrier and a rearward tail portion which is provided with a tail control surface assembly and which can possibly have a drive. The carrier itself is formed in one piece with its head portion and with its tail portion, and adaptation to the different sub-projectiles to be distributed is effected by intervening in the separating wall internal fitment of the carrier. Interchange of the carrier as such for firing different payloads is not addressed. That means that the flight dynamics characteristics of the carrier are not influenced by use with different sub-projectiles.

A problem of a completely different kind is the avoidance, with which US No 4 364 530 is concerned, of a high apogee of the launch curve of a sea missile which is to be launched from a submarine or from a surface ship in order to remain with the launch curve below the enemy radar horizon and thereby not to betray the launch co-ordinates. That is achieved in that the rocket which is already present for the launch is equipped at the rear with a thrust vector control

module which immediately after lift-off diverts the more or less vertical trajectory into an approximately horizontal trajectory in which then after increasing the afflux speed rocket guidance is effected in conventional manner with control surfaces in the medium or load range of the rocket and with tail fins at the rocket motor in front of the booster which is to be discarded. No mention is made of mission-dependent exchange of the payload as in the above-described state of the art or indeed interchange of the payload selection overall.

US No 4 899 956 is also not concerned with optimisation in the region of the projectile payload section. Rather, it is provided here that the screw means between the warhead and the much longer rocket body which is disposed therebetween is opened and screwed thereinto is a module, by means of which the rocket trajectory can be altered by virtue of transversely oriented pulses. That module which is screwed into an intermediate position extends the length of the rocket overall and thus influences the aerodynamic characteristics thereof, and influencing or indeed optimising the region in which the warhead as the payload is disposed is not referred to.

The technical object of the present invention is to provide a system which is more open in terms of the interchangeability of the warheads and which is distinguished in particular also by a great range with nonetheless accurately targeted delivery of the payload.

In accordance with the present invention that object is attained in that, in accordance with the combination of features in the main claim, the payload space is the entire central section of an artillery projectile which is to be ballistically launched and which after the apogee goes into a controlled gliding flight; wherein that section which accommodates very different payloads is disposed between a standard tail section which remains the same for all payloads and which determines the external ballistics immediately after leaving the barrel, and a standard tip section which also remains the same for all payloads and which in turn is provided with canard or nose-mounted control surfaces for a controllable glide and with navigation devices such as inertial and/or satellite navigation for payload delivery of the utmost possible pinpoint accuracy.

The central section which can be interchangeably inserted between those two standard end sections has in its hollow-cylindrical peripheral casing at least one warhead in the manner of target-seeking submunition, a bundle of bomblets to be spread, a high-energy warhead or a post-acceleratable bar penetrator. A suitably produced projectile casing portion of the central section is then flange-mounted to the standard bottom section and the standard tip section, for example being connected together by radial pins or by a kind of bayonet coupling. At any event the projectile has a unitary airframe for very different payloads and for that reason, because of unchanged external ballistics, is to be handled without any problem for firing from the artillery canon, irrespective of the payload which is to be fired at that time.

In regard to further details, developments and advantages of the structure according to the invention, besides the appendant claims, attention is also directed to the description hereinafter of a preferred embodiment of the structure according to the invention which is diagrammatically illustrated in the drawing without being true to scale, being limited to what is essential.

The single Figure of the drawing is a view in axial longitudinal section through a range-enhanced gliding projectile which is to be launched

ballistically, with an interchangeable payload section between standard end sections.

The diagrammatic view shows in longitudinal section a projectile 11 which is to be fired from an artillery canon, that is to say ballistically, and which is divided into three in the axial direction, namely it has a load section 14 which can be inserted between a tail section 12 and a tip section 13. The load section 14 is therefore no longer a loadable load space in a continuous projectile casing, but it embodies the completely interchangeable central region of the projectile 11 together with its wall 15.

The payload space 16 within the wall 15 of the central or load section 14 of the projectile 11, as mentioned above, can be equipped with different warheads and in particular with warheads for attack on hard-armoured target objects. A suitably produced load section 14 can then be equipped in the completion phase with the tail section 12 and the tip section 13 in order to complete the projectile 11.

The projectile 11 is fitted with stabilisation fins 17 which are oriented rigidly in parallel relationship with the axis and which comprise for example steel sheet and which are applied against the cylindrical external peripheral surface of the tail section 12, under a spring bias, until launch from the barrel. So that they are held in that slightly sub-calibre launch position, a cup-shaped cover 18 is pushed from the rear over the tail section 12 with those stabilisation fins 17 peripherally surrounding it. The hollow-cylindrical annular wall 19 prevents the stabilisation fins 17 which are applied against the cylindrical surface of the tail section 12 from becoming deployed.

A peripherally extending guide band 21 is inserted into a radially shallow, axially wide groove 20 provided in the external peripheral surface of the annular wall 19. This is designed as a so-called slip-through guide band 21, that is to say it is not non-rotatably connected to the projectile 11, in order to reduce the stabilisation spin which is produced when the projectile is fired from the barrel, by the rifling thereof, to about 10% of the natural value, because the projectile 11 is not intended to fly in a spin-stabilised mode, in an external ballistic phase, that is to say after leaving the mouth of the barrel, but is to be aerodynamically stabilised by the fins

17 which are then extended somewhat radially outwardly. In principle, to reduce that spin in the barrel it can admittedly also be provided that the annular wall 19 is caused to rotate with respect to the projectile 11, that is to say with respect to its tail section 12; however it is structurally easier for the cover 18 with the annular wall 19 to be fixed non-rotatably on the tail section and for the guide band 21 to be allowed to slip through in its groove 20.

When the tail section 12 leaves the mouth of the barrel, the bottom suction effect behind the cover 18 and the components of the dynamic pressure forces, which act on its annular wall 19 in parallel relationship with its axis, cause the annular wall 19 to be displaced axially rearwardly and finally cause it to be entirely pulled off the tail section 12, thereby releasing the stabilisation fins 17, which are still in a condition of bearing against the external periphery of the tail section 12, for radial extension thereof. That deployment effect can be implemented about axes which are parallel to the projectile axis, under the effect of centrifugal force; however, as already mentioned, it is more appropriate for the stabilisation fins 17 to be made from spring plates which are each rigidly connected (for example riveted) to the tail section 12 along an edge and which, upon being released, possibly also assisted by a flexural spring, are released from the condition of being held in contact against the tail section 12 by the annular wall 19 into a position of radially projecting in a curved configuration parallel to the longitudinal axis 22 of the projectile.

Like the tail section 12 the tip section 13 is also designed as standard independently of the layout of the load section 14. It is provided with canard or nose-mounted gliding wings 23 which emerge from the contour of the ogive 24 for example by a pivotal movement as soon as the projectile 11 has passed through its apogee on its initially ballistic launch trajectory. The wings 23 serve both for the gliding phase and also for steering towards the target. Initially there is a transition from the ballistic descent path following the apogee, into an extendedly controlled glide in order in that way to achieve a correspondingly greater range as a consequence of a markedly shallower path of descent. At the same time the

projectile is steered towards the predetermined target point by means of an inertial or satellite navigation system. That flight guidance is effected by pivotal movement of the gliding wings 23 out of the neutral position, parallel to the generatrix of the ogive 24, by means of a steering unit 25 which in turn is actuated by way of a navigation device 26 in order then to transfer from the shallow glide into a steep attack trajectory with the projectile 11 shortly before flying over the predetermined target point. Finally, closely above the target, from that steep attack trajectory, an ejection device 28 is activated by a fuse 27 which acts for example in distance-oriented relationship with respect to the surrounding terrain, in order to separate the tip section 13 from the load section 14 and to empty the payload space 16 by way of that separation location directly into the more closely confined target area.

Therefore in accordance with the invention an inexpensive terminal phase-steerable artillery munition of markedly increased range and acquisition accuracy for use which is universal in terms of variable payload under aerodynamic conditions which are always the same by virtue of maintaining the external-ballistic projectile coefficients is afforded if, in an aerodynamically stabilised gliding projectile 11 inserted between a standardised tail section 12 which initially determines the external ballistics and an also standardised tip section 13 which in the terminal phase determines range and precision is a load section 14 which connects the two contours of said sections together and which can be equipped with very different warheads which in particular are optimised against hard targets. For launch into an aerodynamically stabilisedly ballistic trajectory the tail section 12 is provided with super-calibre stabilisation fins 17 which in the barrel, in the firing position of being applied against the peripheral surface of the tail section 12, have an annular wall 19 engaging thereover, the annular wall 19 being provided with a slip-through guide band 21 for initial reduction of spin while still in the barrel. Preferably immediately after passing the apogee of the ballistic trajectory nose-mounted gliding wings 23 are extended from the tip section 13, by means of which wings 23, by way of a steering unit 25, a transition is implemented from the descending

path of the ballistic trajectory into a shallower gliding path of therefore greater range, from which finally under navigational control there is a steeper descent into a more closely predetermined target area into which the load section 14 delivers its payload.

CLAIMS

1. A carrier which is in three parts in the axial direction for different payloads which can be launched from a distributor device which is equipped with an aerodynamic tip section (13) and a tail section (12) with stablisation fins (17), characterised in that the distributor device is the interchangeable load section (14), which has a hollow-cylindrical casing around its payload space (16), of an artillery projectile (11) with external ballistics which are the same for all payloads, which artillery projectile is to be launched by means of a guide band (21) slipping through at the tail section (12) ballistically with reduced spin but which is aerodynamically stabilised immediately after launch and which after the apogee can be transferred by a steering unit (25) in the tip section (13), which is navigationally guided in target point-oriented fashion, into the extended glide path of a flattened descent path with correspondingly increased range, by means of pivotable canard gliding wings (23) which can be extended from the ogive (24) of the tip section (13), and then shortly before flying over the predetermined target point it can be actuated by means of the gliding wings (23) out of the shallow descent path into a steep attack trajectory in order closely above the target, by a fuse (27) which acts in distance-oriented relationship, to activate an ejection device (28) contained in the tip section (13), for separating the tip section (13) from the load section (14) to clear an ejection opening, by way of which the payload space (19) can be emptied directly into the more closely confined target area.

2. A projectile according to claim 1 characterised in that the tail section (12) includes the bottom of the projectile and stabilisation fins (17) which can be radially extended in a super-calibre configuration.

3. A projectile according to claim 2 characterised in that, when the stabilisation fins (17) are applied against the external peripheral surface of the tail section (12), the tail section (12) is surrounded by an annular wall (19) which, upon launch from the barrel, upon enablement of deployment of the stabilisation fins (17), is pulled off rearwardly from the tail of the projectile (11) parallel to the axis.

4. A projectile according to claim 3 characterised in that the annular wall (19) is surrounded by a guide band (21).

5. A projectile according to claim 4 characterised in that the guide band (21) is fitted into a groove (20) extended around the annular wall (19), the guide band being adapted to controlledly slip through said groove.

6. A projectile according to one of claims 3 to 5 characterised in that the annular wall (19) is the wall of a cup-shaped cover (18) which is pushed at the tail end on to the tail section (12) with the stabilisation fins (17) folded against the wall thereof.

7. A projectile according to one of the preceding claims characterised in that the tip section (13) is equipped with gliding wings (23) which can be extended from the contour of the ogive (24).

8. A projectile according to claim 7 characterised in that provided in the tip section (13) is a navigationally controlled steering unit (25) for canard gliding wings (23).

9. A projectile according to one of the preceding claims characterised in that provided in the tip section (13) is a separating device (28) activatable by a fuse (27) for opening an ejection opening with a connection between the load section (14) and the tip section (13) being exploded open.