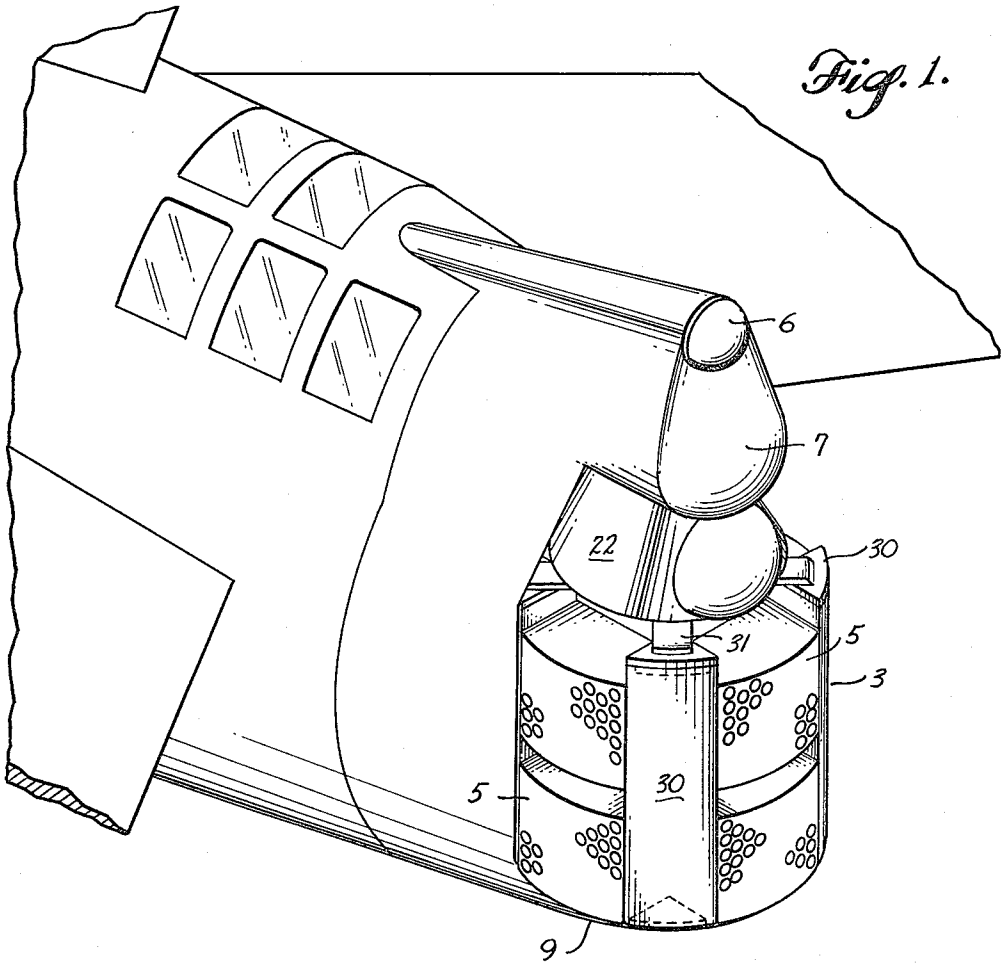
May 31, 1960 C. E. MYRON 2,938,434

MISSILE TURRETS FOR AIRPLANES

Filed May 3, 1956 3 Sheets-Sheet 1

Fig. 1.



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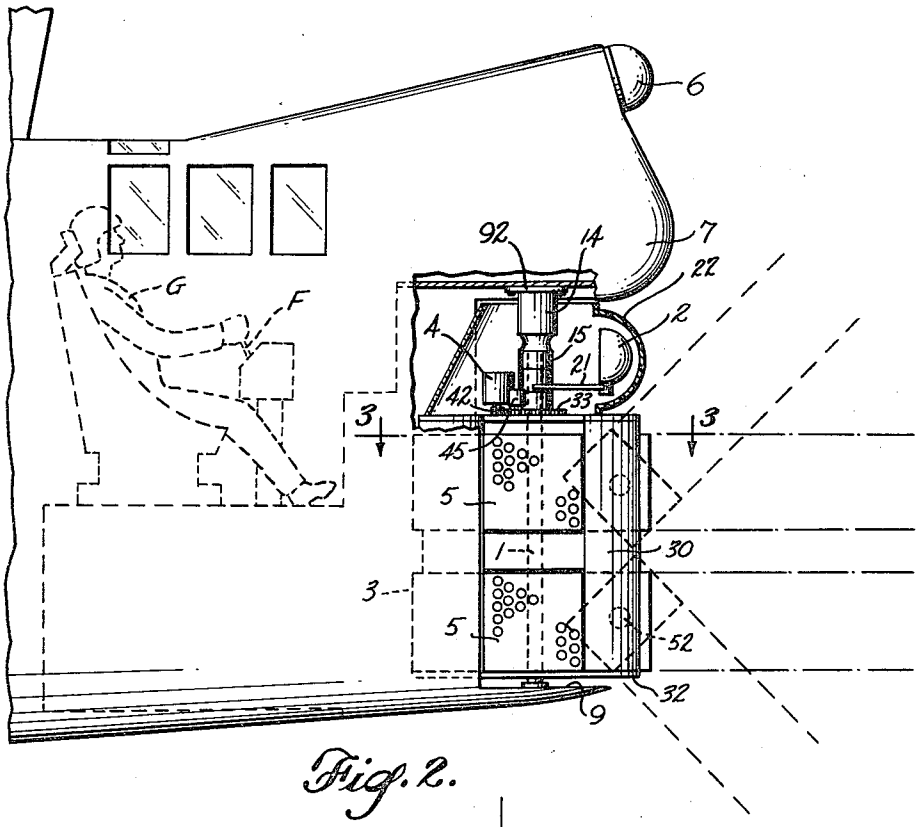


Fig. 2.

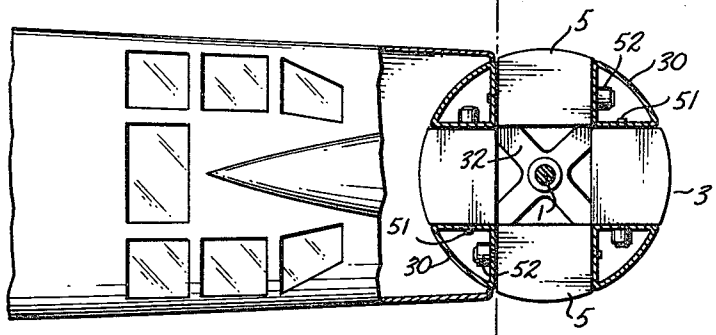


Fig. 3.

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MISSILE TURRETS FOR AIRPLANES

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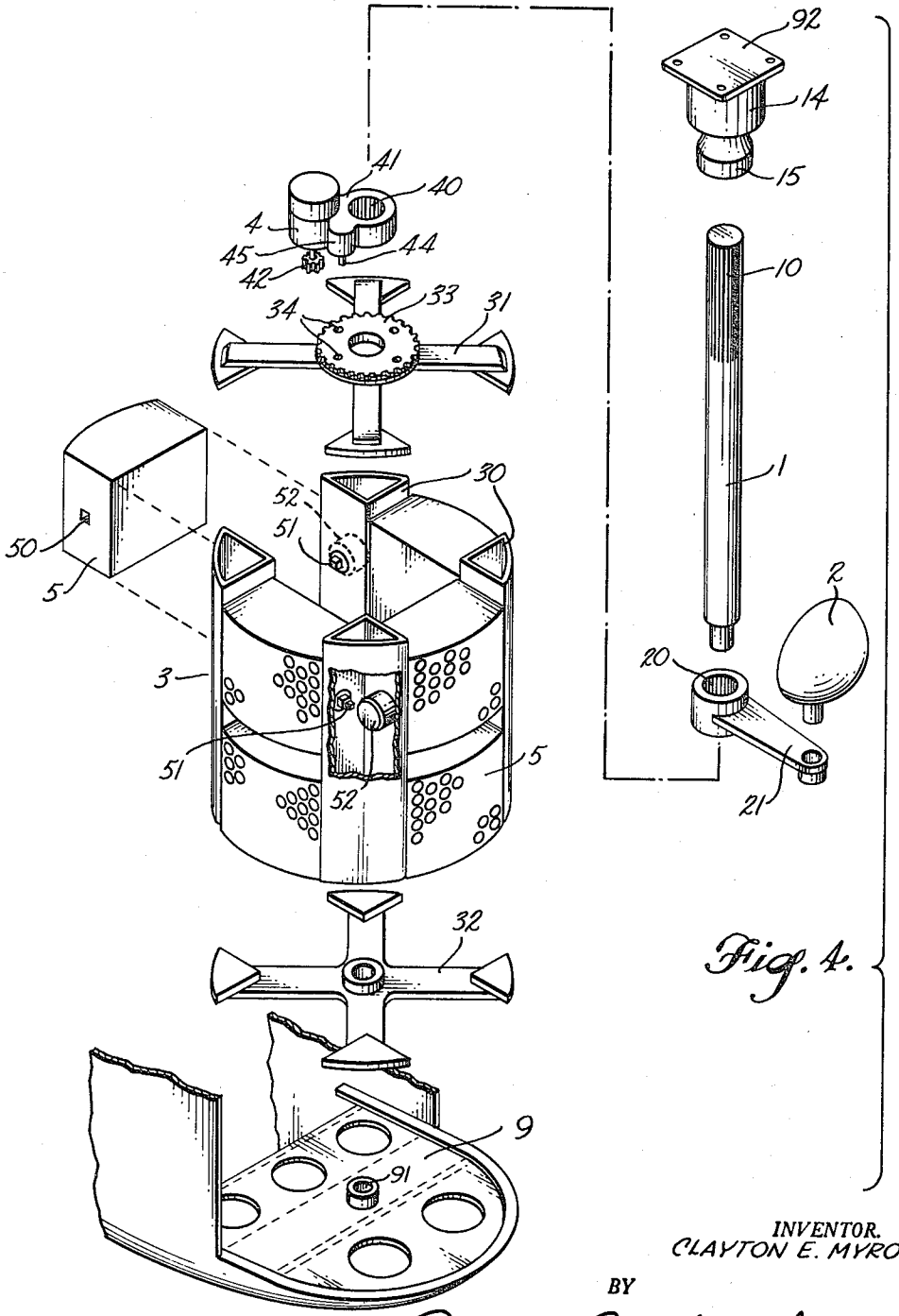


Fig. 4.

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MISSILE TURRETS FOR AIRPLANES

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9 Claims. (Cl. 89—37.5)

This invention relates to missile turrets such as are mounted in the tail of a bomber airplane for defense against attacking fighter airplanes.

It was common practice prior to the advent of jet powered airplanes to mount a machine gun in the tail of a bomber, and to aim the same visually, and to fire it, by a gunner stationed in the tail. The speed of jet planes is such that a human gunner has little chance of following the evolutions and gyrations of a fighter plane coming up behind a bomber, hence is unlikely to bring effective fire to bear upon such an attacking fighter. Moreover, the fighter can take such rapid evasive action that a machine gun is unlikely to make a fatal hit upon the fighter, and a missile package, multiplying and somewhat spreading the fire pattern, is far more likely to make an effective hit. However, such a missile package discharges all its missiles in an instant, and if they miss, the bomber would be unprotected until the discharged missile package could be replaced with a fresh one and the latter aimed and brought to bear upon the target. This would take so much time that, in effect, the bomber would be helpless if the missile package first fired failed to hit the target.

According to the present invention, a turret is provided for mounting in the tail of an airplane, capable of being rotated in azimuth and of supporting a plurality of missile packages, each capable of being tilted in elevation, but arranged in different sectors of the turret so that any selected package of missiles can be aimed and brought to bear upon a target, and after it has been fired the turret is capable of being indexed immediately to bring the missile package in the next or a succeeding sector of the turret to bear, in azimuth and in elevation, upon the same target, ready for firing thereon. In this way, by reloading the discharged missile packages as the turret indexes to each new position, the turret can always be kept loaded and ready for discharge against a selected target.

In the preferred arrangement, the aiming is accomplished automatically through the intermediary of a track radar unit, which can be brought to bear upon a target and locked thereon, so that the track radar unit will follow the movements of the target, namely, the attacking fighter, and will automatically cause corresponding aiming movements in azimuth and in elevation for at least such missile package or packages as are in the firing sector.

Further, according to this invention, in the preferred form means are provided for releasing the turret for indexing rotation and for effecting such rotation, immediately upon the discharge of the missiles from the package which is in the firing sector, so that the next missile package in a following sector is immediately indexed rotatively and brought to bear, in conjunction with the same aiming device upon the same target. Thus, there is no loss of time in bringing a fully loaded second missile package to bear upon a target, following discharge of a first missile package.

Although in the preferred arrangement the aiming is accomplished automatically by the track radar unit mentioned above, it is also provided in accordance with this invention that the aiming may be accomplished automatically by an optical system under control of a gunner, or may be accomplished visually and directly by the gunner.

It is an object of this invention to provide a turret of the character described which shall be of relatively simple construction and as light in weight as is consistent with the requirements thereof, and which may be provided with the usual safety features and the like, all as will be explained more fully hereinafter.

The track radar unit is itself known, and has been used in the aiming of guns, hence the invention herein does not lie in the use of any particular track radar unit, but involves adapting a known unit to the aiming of an indexing missile package and the turret wherein the same is mounted. Neither is the optical aiming system, nor the visual aiming, both old in conjunction with guns, a part of this invention, other than broadly, in the adaptation of a known system to the indexing missile package and its supporting turret. Rather, the invention herein is concerned with the turret mount for removable and replaceable missile packages, which mount for the turret and for the individual packages permits aiming of each by known radar, optical, visual, or other systems, together with the means whereby the turret can be indexed, so that certain missile packages as they come into the firing sector, bear upon the same target that the previously fired missile package fired upon. Primarily the invention here concerns the turret, its mount, and the mount therein of the missile packages.

The accompanying drawings illustrate somewhat diagrammatically such a turret and the operating mechanism therefor, although they omit various safety devices, interlocks, controls and the like, such as are more or less common in this art.

Figure 1 is a quartering rear elevational view, in isometric projection, of the turret and the associated tail portion of an airplane, and Figure 2 is a side elevational view of the same with parts broken away and shown in section.

Figure 3 is a general plan view, with a part in section along the line 3—3 of Figure 2.

Figure 4 is an exploded isometric view of the several parts of the turret.

An upright shaft 1, defining the axis of rotation of the turret, is supported at 91 in a shelf or lower bracket 9 which is part of the aircraft structure. The splined upper end of the shaft at 10 is received within the chuck 15 upon the end of the shaft of a reversible azimuth motor 14, or is otherwise rotatable by such a motor. The motor 14 is fixed to the aircraft structure by a mount plate 92. The turret 3 consists generally of upright columns 30 supported between an upper spider 31 and a lower spider 32, these spiders being mounted upon but freely rotative with respect to the shaft 1. The turret, as will be explained more fully hereinafter, is divided thus to define a plurality of sectors for the support of missile packages 5.

The turret 3, it will be observed, is free to rotate about and relative to the shaft 1, and rotation of the shaft will not rotate the turret unless the two are locked together in some manner. The means to lock them for conjoint rotation will be described later.

An index arm 41 is splined at 40 so that it, too, is fast to the shaft 1, wherefore the index arm 41 rotates with the shaft. This index arm at its outer end mounts an indexing motor 4, and this motor or the index arm 41, or both, are arranged to be locked to the turret during aiming and firing of the missile packages 5, yet upon release of the lock and energization of the indexing motor 4, the turret may be rotated into a newly indexed posi-

tion with respect to the shaft 1. For instance, the indexing motor 4 may drive a pinion 42 which, meshing with a gear 33 upon the spider 31, will hold the motor and turret locked together, or will effect rotation of the turret relative to the index arm 41. Since such indexing should only be through the angular sector corresponding to the angular spacing of the firing sectors of the turret, and there being four such angular sectors illustrated, it is preferred that means be provided for positively locking the index arm 41 to the turret in each attained or indexed position. To this end, the locking means includes preferably such a lock as is suggested by the bolt 44 carried by the index arm 41, engageable in turn within each of the sockets 34 in the gear 33. Solenoid means housed at 45, or any equivalent means, may be provided to effect withdrawal of the bolt 44 from a given socket 34 to permit indexing rotation of the turret relative to the index arm 41, and the circuit for controlling such a solenoid at 45 may be so coordinated with the circuit which energizes the indexing motor 4 that the release of the lock at 44 is accomplished substantially simultaneously with energization of the indexing motor 4.

Each missile package 5 is removably and tiltably supported within the turret 3. Since its tilting for elevational aiming must be controlled it is preferred that the missile packages be provided, for example, with a square socket 50 at each side for engagement with a squared end 51 of a reversible elevational motor 52 pertaining to the given missile package. Arrangements are provided, but not shown, for withdrawing the shaft 51 and a corresponding trunnion opposite the same from the sockets 50, for removal and replacement of a discharged missile package. Each missile package may provide a group of missiles all aimed substantially alike and delivering a pattern of fire of given type at a selected range, the pattern being calculated as sufficient to effect a hit upon a target airplane.

As has been indicated above, the missile packages may be aimed in azimuth and in elevation by any of several means. Preferably, they are aimed by a track radar unit 2, which is mounted upon the end of a radar arm 21, the latter being splined at 20 for securement fast to the splines 10 of the shaft 1. No attempt is made herein to illustrate the radar control circuits or mechanism between the track radar unit 2 and the azimuth motor 14 and the several elevational motors 52, but such interconnecting devices are known in the art. By means of such devices, the gunner at G in Figure 2 can lock the radar unit 2 on a selected target, for instance an approaching fighter plane, before the latter comes within range, and the track radar unit 2 will then follow the target and will cause the azimuth motor 14 to be energized in such amount and in such direction as will maintain one of the sectors of the turret 3 and the missile packages 5 mounted therein trained in azimuth upon the target. It is not to be implied that the packages are directed at the target, but the radar controlled mechanism can be made to aim the missile packages with sufficient lead on the target as to effect a hit at a range within the effective firing range. In like manner, the track radar unit 2 will energize the elevational motors 52, so that they will be maintained properly aimed in elevation upon the same target. The track radar unit is housed at 22, this housing being mounted upon and rotative with the turret 3.

It then becomes a simple matter for the gunner, through his firing control F, to effect discharge of the missile package which bears upon the target whenever, in the gunner's judgment, the target is within effective range. This control may be linked to the indexing motor 4 and to the solenoid at 45, or the two latter may be separately controlled, in such manner that immediately upon the firing of the missiles from the proper sector of the turret, the lock at 44 is released, the indexing motor at 4 is energized, and the turret is rotatably indexed, the lock 44 being immediately freed to reengage, and reengages in such position that the next sector with a loaded but undischarged missile package bears upon the same target. If, in the short space of time required for indexing, the target has shifted with relation to the supporting airplane, the shaft 1 will have followed the target under the influence of the track radar unit 2, yet the turret will lock again to the shaft in the proper position to bear upon the target. Moreover, the fresh missile package will be properly aimed in elevation.

Means may be provided for designating a particular sector of the turret which is to fire next. That mechanism may be interconnected with the track radar unit, so that only the sector of the turret which corresponds in bearing to the track radar unit will be armed and ready for discharge, and all others will be safe. Such interconnecting and safety devices have not been illustrated herein, since of themselves they constitute no part of the invention, and are readily provided by one skilled in the art.

It is believed that it will be clear how the track radar unit 2 is locked on the target and causes the turret and selected missile packages to follow the target, both in azimuth and in elevation, until such time as the missiles are discharged. Immediately, and preferably automatically, the turret indexes to the next firing position, and a loader within the aircraft structure can remove the discharged missile package and replace it with a fresh one. The loader may have available control means to interdict indexing of the turret until the fresh missile package is in place. As illustrated, there are two missile packages in each of the four sectors, each tiltable in elevation separately from the other. Such an arrangement affords somewhat greater ease of handling and occupies a minimum of space. The mounting is in such manner that the missile packages may fire anywhere within an azimuthal sector of 180°, and anywhere in elevation or depression between 90° limits.

Such an airplane would also preferably incorporate optical aiming means, and the same has been suggested at 6. In addition, it would be desirable to provide manual aiming means capable of being employed by the gunner in the event the automatic aiming devices do not function. Also, such an airplane would normally be equipped with a search radar unit, suggested at 7, by means of which the gunner can the more readily scan the skies behind him and be warned of the approach of another airplane and the location thereof, so that he may lock the track radar unit 2 on such a target in advance of his being able actually to see the same.

I claim as my invention:

1. In combination with the structure of an airplane, an upright shaft journaled therein, an azimuth motor mounted upon said structure and operatively connected to said shaft to revolve the latter in azimuth, upon energization of the motor by a suitable aiming means, a turret freely rotatable about said shaft, means to lock said turret to said shaft in any of a plurality of angularly spaced positions, for revolution of the turret with the shaft by said azimuth motor, means for mounting individual missile packages in said turret, in sectors corresponding to each such angularly spaced position, for tilting in elevation, elevational motor means so to tilt the missile packages, upon energization of the same aiming means, and means operatively interconnected between the turret and the shaft, and operable upon release of said locking means, to index the turret rotationally relative to the shaft following discharge of a first missile package, to orient a second missile package originally in a different angularly spaced position correspondingly to orientation of the first such missile package, the locking means being reengageable to lock the turret in such rotated position relative to the shaft.

2. The combination of claim 1, characterized in that the aiming means includes a track radar unit, and an

arm mounting the same and itself fixed upon the shaft, whereby as the track radar unit tracks the selected target it energizes the azimuth and elevational motor means to effect corresponding rotational movement of the shaft and turret and tilting movement of the selected missile package, to maintain the latter aimed at the selected target.

3. The combination of claim 1, wherein the turret-locking means includes an index arm fast to the shaft and disposed close to the turret, a lock bolt on one of the turret or the index arm, and a plurality of sockets on the other for the reception of said lock bolt, said sockets being angularly spaced about a circle in accordance with the turret's sectors, whereby upon withdrawal of the lock bolt from its socket and energization of indexing means to rotate the turret relative to the shaft until the lock bolt reengages in another socket.

4. The combination of claim 3, including means for withdrawing the lock bolt, which is operatively connected to the indexing means, for withdrawal of the lock bolt substantially coincidentally with initiation of the indexing operation.

5. In combination with the structure of an airplane, an upright shaft journaled therein, aiming means including a radar arm fixed to said shaft and a target-tracking element mounted upon said radar arm, an azimuth motor mounted upon said structure and operatively connected to said shaft to revolve the latter upon energization by said target-tracking element, an index arm fast to said shaft, an indexing motor carried by said index arm, a turret freely rotatably supported upon said shaft, positive drive means interconnecting said indexing motor and said turret to rotate the latter relative to the shaft, through selected angular sectors, upon energization of the indexing motor, means to mount a missile package in said turret, in each such sector, for elevational tilting, elevational motor means so to tilt each missile package so mounted, relative to the turret, upon energization by said target-tracking element, whereby through energization of the azimuth motor and of the elevational motor means pertaining to a missile package in a selected sector of the turret, to train that missile package in azimuth and in elevation to bear upon a selected target being tracked by the target-tracking element, and, following energization of the indexing motor, to train a second missile package in a different sector upon the same target.

6. The combination of claim 5, including positive locking means interconnecting the index arm and the turret in each angular sector, said locking means being disengaged conjointly with energization of the indexing motor, and reengaging when the turret is rotated into its new aimed position.

7. The combination of claim 5, wherein the positive drive means interconnecting the indexing motor and the turret comprises a motor driven pinion and a meshing gear upon the turret.

8. In combination with a vehicle and a turret rotatively mounted thereon upon an upright axis, means for removably supporting each of a plurality of like missile packages in the turret, for rotational movement therewith, said package-supporting means including means for elevational tilting of the several packages relative to the turret, each upon its individual transverse axis, means for aiming a given missile package in azimuth, by traversing rotation of the turret as a whole about its upright axis, means for aiming the same missile package in elevation, by tilting it about its transverse axis, and means separate from the aiming means and normally operable following discharge of the missiles from the first such package, to index a second missile package into position bearing upon the same target.

9. In combination with a vehicle and a turret rotatively mounted thereon upon an upright axis, means for removably mounting each of a plurality of like missile packages in the turret in different angular sectors, including a firing sector, for controlled tilting of each such package about a transverse axis, and for bodily rotation about the turret's upright axis, means for aiming a missile in the firing sector package in azimuth, by traversing rotation of the turret, means separate from the aiming means operable to index the turret rotationally by an angular amount to direct a second missile package azimutually into the same firing sector, means for aiming each missile package, in elevation, by tilting it about its transverse axis, and means to control discharge from an aimed missile package in the firing sector.

No references cited.