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[54] **PROJECTILE FOR TRAINING AMMUNITION**

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[51] **Int. Cl.** **F42b 13/20,** F42b 15/14

[58] **Field of Search** 102/41, 92.7; 244/3.23

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[57] **ABSTRACT**

Training ammunition in the form of a projectile having spin braking means arranged in the front part thereof. The spin braking means includes a central bore extending from the tip of the projectile partially therethrough with the rear portion of the central bore being in communication with the outer surface of the projectile via discharge channels arranged about the central bore. The rear portion of the central bore is provided with a deflecting lobe having a cross section which increases rearwardly for directing the air flow into the discharge channels in order to minimize turbulence in the air flow. The central bore and discharge channels operate in the manner of a rotary compressor with radial rotors in that air flow therethrough during the flight of a spin stabilized projectile effects braking of the projectile in a predetermined manner to reduce the flight range of the projectile. With known flight characteristics of a projectile, the cross-sectional size of the central bore and discharge channels can be selected to produce a predetermined braking effect and a predetermined flight range for the projectile.

59 Claims, 7 Drawing Figures

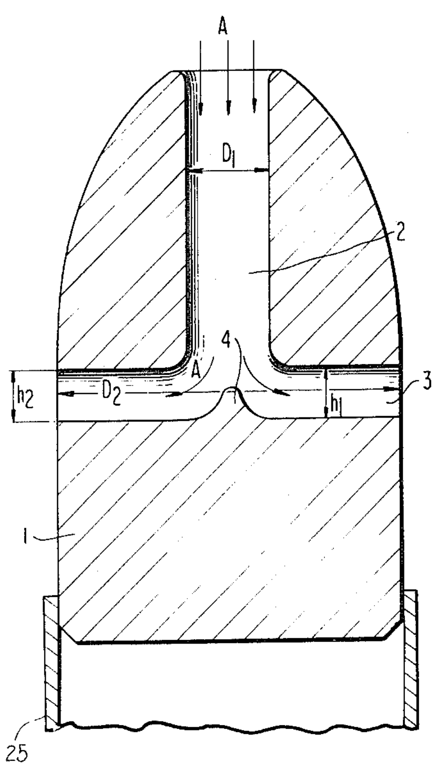


FIG.1

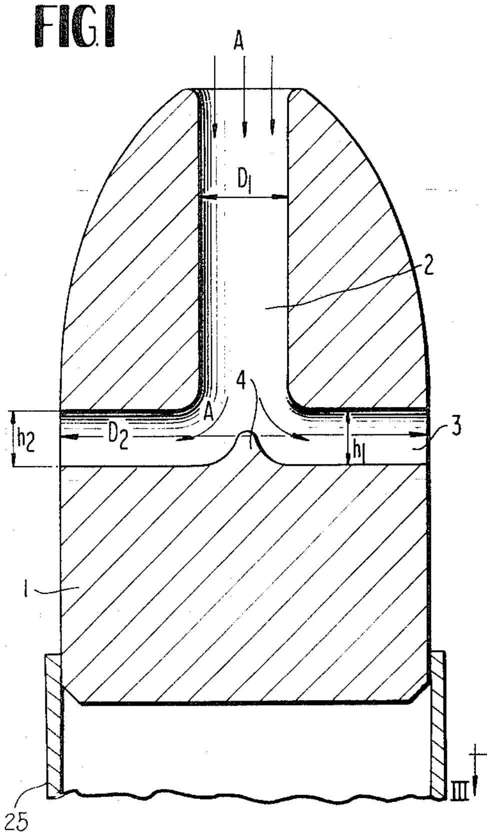
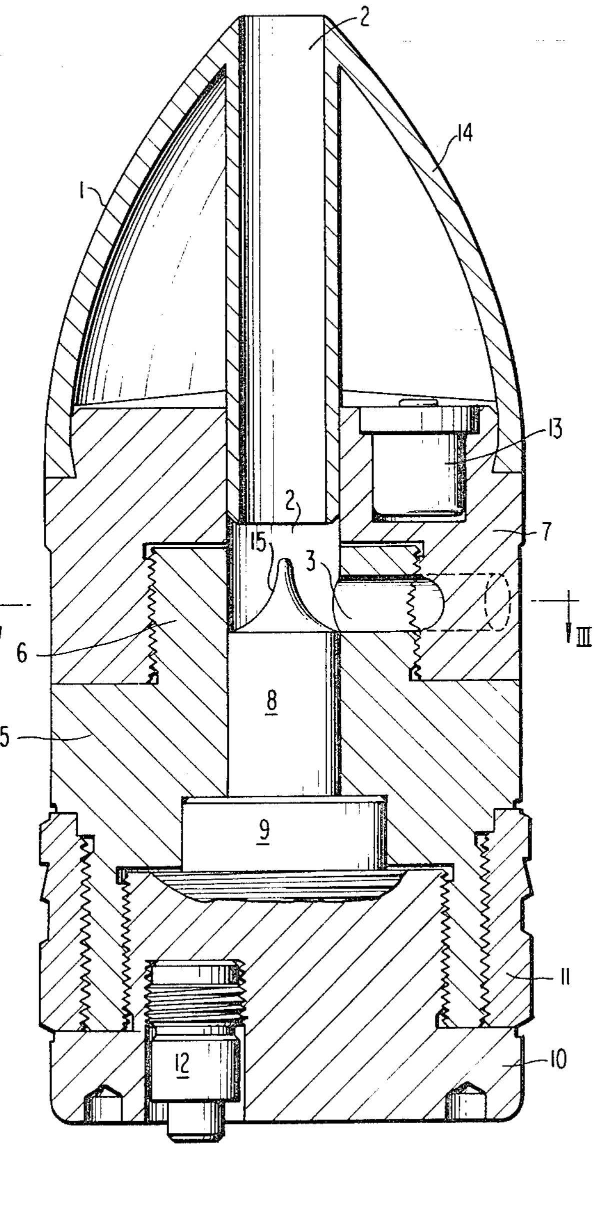


FIG.2



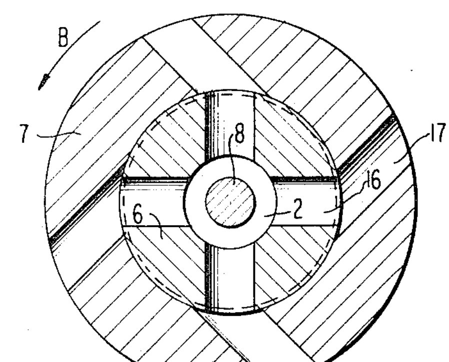


FIG.3

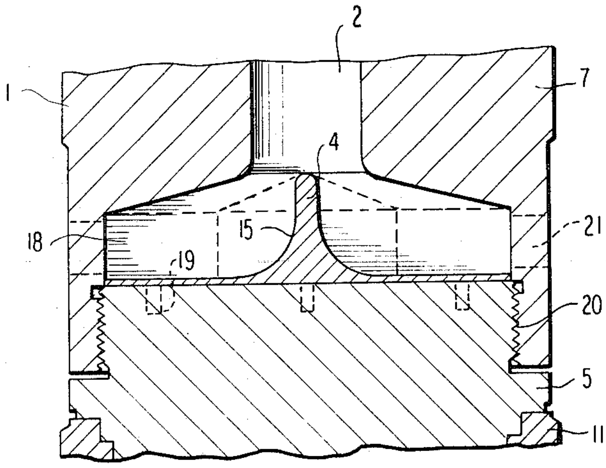


FIG.4

FIG.5a

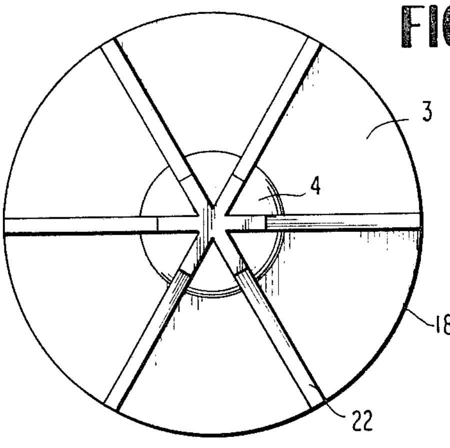
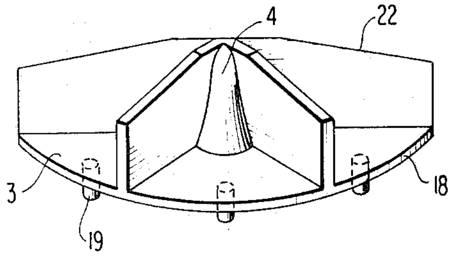


FIG.5b



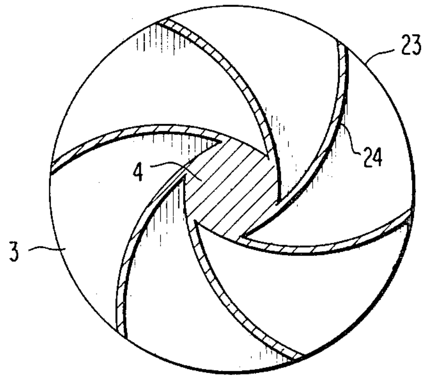


FIG.6

PROJECTILE FOR TRAINING AMMUNITION

The present invention relates to training ammunition having a reduced flight range and capable of being utilized on small firing ranges.

Due to the relatively long range of live ammunition, the firing of this ammunition must take place at a firing range and one is limited to a small number of large firing ranges and practice grounds with respect to the combat training of troups. In order to eliminate this disadvantage and to make it possible to conduct practice firing also on smaller ranges, a gallery or dummy ammunition has been produced which is lightweight and a short-range projectile of a synthetic resin. However, difficulties ensued in this connection regarding the function of automatic weapons utilizing this type of ammunition. Although these difficulties could be overcome by increasing the weight of the ammunition by providing the synthetic resin with chips, granules, or the like of a heavy metal, this, in turn, was equivalent to an increased range of the projectile.

Another conventional way for providing a training ammunition which, except for a shortened range of the projectile, conforms as closely as possible to the corresponding live ammunition with respect to the properties thereof, resides in that the projectile is formed in the manner of live ammunition and is provided with a continuous central axial bore. The bore has an inside cross section which can be up to one third or more of the caliber cross section, and which can additionally be of a special configuration for the purpose of effecting an axial braking of the projectile.

The present invention provides a training ammunition having a reduced range wherein the projectile is controlled in an exactly predetermined manner by braking the spin to below the minimum spin required to maintain the stable flight of the projectile. In this manner, the use of the training ammunition constructed in accordance with the present invention is possible on small firing ranges. An initial consideration is that the firing of the ammunition from the original weapon takes place at a known spin angle, and a prerequisite is that the projectile leaves the barrel of the weapon at a spin speed which is so far above the minimum speed necessary for a stable flight that a stably traversed flight path of a desired length is the result, with a continuous braking of the spin starting at the instant of departure. This is accomplished, according to this invention, by providing the tip portion of the ammunition with a spin-braking means.

In accordance with the present invention, it is possible by appropriate configuration and dimensioning of the spin-braking device to brake the rotation of the projectile during its flight in such a manner that this rotation, after a flight path which is predetermined within certain limits, falls below the minimum rotation required for spin stabilization. The projectile begins to tumble, finally is pivoted by 180° vertically to its axis of rotation, and continues its flight with the rear of the projectile pointing forward. However, this is connected with an increase in the air resistance or drag which can be influenced by the configuration of the rear of the projectile, such that a shortened maximum range of the projectile is provided.

Accordingly, the training ammunition is usable in a similar manner to that of live ammunition and exhibits initially the same behavior with respect to external ballistics and consequently also the same flight path as the live projectile. Therefore, the same sighting adjustment can be utilized for firing the training ammunition as that for live ammunition. At the same time, the maximum firing range is smaller than in case of live ammunition, so that the practice projectile can be utilized with great versatility on firing ranges having a smaller safety zone.

In accordance with an embodiment of the present invention, the spin-braking means is formed as a bore of the blind-hole type starting at the tip of the projectile with the rear of the bore ending within the projectile and being in communication with bores at the jacket of the projectile via preferably radially disposed channels. In this arrangement, the air entering the central bore and dammed up therein flows via the channels and communicating bores toward the outside. Due to appropriate arrangement and configuration of the mouths of the bores, the projectile imparts to the exiting air an impulse which is in opposition to the spin direction such that the rotation of the projectile is braked by the amount of the impulse. Since this spin-braking means basically has the effect of a rotary compressor, the energy requirement of which is covered by the rotational energy of the projectile, the central bore and the discharge channels are formed in accordance with the known principles of rotary compressors with radial rotors. Thus, in dependence on the predetermined external ballistic data of the projectile, the discharge channels and central bore of the spin braking means may be designed to have the effect of a radial rotor, initially, i.e. without lengthy experiments, in such a manner that the decrease in rotational energy and thus also the passing of the stability limit of the projectile toward instability take place in a predetermined manner.

According to a feature of the present invention, the inside diameter of the central bore is selected to be between approximately 10 and 40% of the caliber of the projectile. This diameter range is preferable since a smaller inside diameter could provide an insufficient flow of air through the central bore and a larger inside diameter with correspondingly shorter discharge channels could undesirably reduce the energy transfer to the exiting air. In order to ensure that the air flows off from the central bore as unhindered as possible, it is advantageous, according to another feature of the invention, to choose the inside entrance cross section of all discharge channels taken together to be larger by at least about 20% than the inside cross section of the central bore. Other features of the present invention include the arranging of the outlet openings of the discharge channels in the cylindrical portion of the jacket of the projectile in order to obtain as large a pressure gradient as possible for the air flow through the central bore and through the discharge channels, thereby enhancing the discharge of air. Moreover, in order to keep the influence of any asymmetrically effective transverse forces due to the air flow through the projectile as small as possible, the discharge channels may be positioned at least approximately in the zone of the cross-sectional plane defined by the center of gravity of the projectile. In this manner, the resultant of any uncompensated lateral flow forces within the discharge channels, which are disposed, for example, in a plane or also on a conical surface, is arranged to be effective at least approximately in the center of gravity of the projectile, whereby any pitch moments are advantageously diminished or eliminated.

In accordance with another embodiment of the present invention, the projectile which can be formed in one piece, for example by casting, is formed of different mating portions in order to keep the manufacturing expenses as low as possible. The projectile is divided in the region of the discharge channels in such a manner that one part having a lug engages into a corresponding recess of the other part, and the discharge channels are each formed as two partial bores which are preferably inclined toward each other and arranged in the lug and in the wall of the recess.

According to a further embodiment of the invention which provides an economical construction suitable for a mass production, the discharge channels are formed in separate components as a radial rotor member. In this manner, the discharge channels can be joined to the projectile in the zone of the rear end of the central bore. That is, the central bore extends completely through the front part of the projectile and the radial rotor is attached at the rear of the projectile to close off the central bore.

The rigid connection of the two parts of the projectile with each other, or of the individually manufactured radial rotor with the projectile divided in the zone of the rear end of the central bore, can be effected in a conventional manner, depending on the particular situation, for example depending on the materials employed or on the forces effective on the projectile, by frictional contact in the manner of a press fit, or also by means of a threaded, plug-in, glue, weld, or solder connection, or the like.

In accordance with another feature of the present invention, a deflecting lobe with a cross section that increases in the flow direction is suitably disposed at the rear end of the central bore in order to minimize turbulence in the air flow from the central bore to the discharge channels. This lobe can have a conical configuration, for example, wherein the diameter of the base corresponds to the diameter of the central bore. However, preferably the design of the deflecting lobe is such that it has a concave surface in its part under the effect of the air flow.

It is therefore an object of the present invention to provide training ammunition which overcomes the disadvantages of prior art constructions.

It is another object of the present invention to provide training ammunition having a predetermined flight path which is of much shorter range than live ammunition.

It is still another object of the present invention to provide training ammunition in the form of a projectile having a spin-braking means in the tip portion thereof which is formed in accordance with the known principles of rotary compressors with radial rotors such that a predetermined spin-braking is effected.

These and further objects, features and advantages of the present invention will become more obvious from the following description, when taken in connection with the accompanying drawings which show, for purposes of illustration only, several embodiments in accordance with the present invention, and wherein:

FIG. 1 is a longitudinal sectional view of a projectile exiting from a barrel of a weapon in accordance with the present invention,

FIG. 2 is a longitudinal sectional view of another embodiment of a projectile in accordance with the present invention,

FIG. 3 is a cross-sectional view taken along line III—III of the projectile of FIG. 2,

FIG. 4 is a fragmentary longitudinal sectional view of another projectile embodiment wherein the radial rotor is formed as a separate component,

FIGS. *5a* and *5b* are plan and elevational views, respectively, of the radial rotor of FIG. 4, and

FIG. 6 is a cross-sectional view of another radial rotor in accordance with the present invention.

Referring now to the drawings wherein like reference numerals are used throughout the several views to designate like parts and more particularly to FIG. 1 which shows a training projectile **1** which is integrally formed, for example by casting, and having a caliber D_2 exiting from the barrel **25** of a weapon. The projectile is provided with a central bore **2** having an inside diameter D_1 and discharge channels **3** extending therefrom. The discharge channels have a height h_1 at the entrance and a height h_2 at the exit. At the rear end of the central bore **2**, a rotationally symmetrical deflecting lobe **4** is integrally formed with the projectile. The discharge channels **3** are disposed approximately in the zone of the cross-sectional plane determined by the center of gravity of the projectile, so that any transverse forces due to the air flow indicated by the arrows A exert only a minor influence on the projectile. The projectile **1** is constructed in a conventional manner of steel, brass, aluminum, or like materials.

In FIG. 2 the projectile **1** is shown as being divided in the region of the discharge channels **3**, only one channel being shown for reasons of clarity, in such a manner that the rear part **5** having a lug **6** engages a corresponding recess of the front part **7**. Both parts are connected with each other by means of a threaded joint. A deflecting lobe **8**, shown in an elevational view, which is manufactured separately for reasons of facilitating the production of the device, is inserted in the rear end of the central bore **2** and held in position by means of a collar **9** and a bottom section **10** threadedly joined to the rear part **5**. As shown, the surface **15** of the deflecting lobe **8**, which is under the effect of the air flow, is concave and formed to be rotationally symmetrical. An annular guide band **11** of, for example, copper, brass, or lead is secured about the rear part **5** and serves to provide a better seal in the barrel of the firearm. The projectile is also provided with a signal flare cartridge **12** which is inserted in the bottom section **10** and a target marking charge **13** is arranged in the front part **7**. It would, of course, be possible to provide, in place of the signal flare cartridge **12** and/or the target marking charge **13**, an impact bursting charge or the like. The tip **14** of the projectile can be produced, for example, of a synthetic resin, aluminum, or also of steel. The selection of the material depends on the weight to be imparted to the projectile, and whether a pyrotechnic target marking is desired. In this case, the tip of the projectile is suitably made of a readily deformable material, preferably polyethylene or aluminum.

The cross section taken along line III—III of FIG. 2, illustrated in FIG. 3, shows the distribution of the discharge channels **3** between the lug **6** and the front part **7** into two mutually inclined partial bores **16** and **17**. If the spin-stabilized projectile rotates, in accordance with the arrow B, in the counterclockwise direction, the mutual inclination of the partial bores **16** and **17**, provided in the same direction, effects the largest possible spin-braking, in that a rotational force in the opposite direction is effected. Of course, depending upon the required braking effect, it is also possible to provide an oppositely directed inclination, or both partial bores can also be disposed so that they are aligned with each other, so that the discharge channels are thus oriented in a purely radial direction.

As shown in FIG. **4**, a rotor **18** which is formed as a separate component is inserted into the projectile **1** which is divided into a rear part **5** and a front part **7**. The radial rotor **18** is secured by means of pins **19** in the rear part **5** with the rear and front parts being connected by means of the thread **20**. In the front part **7**, perforations **21** are provided, which are associated with the discharge channels **3** formed in the radial rotor **18**, in order to make it possible for the air to exit laterally. The front part **7**, as distinguished from FIG. **2**, is manufactured integrally with the tip of the projectile, which portion is not shown.

The radial rotor **18** of FIG. **4** which is illustrated in top plan and elevation views in FIGS. **5***a* and **5***b* is provided with six radially disposed vanes **22** in a uniform distribution such that the discharge channels **3** are formed between these vanes. As shown in FIG. **5***b*, the height of the vanes **22** decreases in the outward radial direction with the mutual distance between vanes increasing in this direction. Both parameters are adapted to each other in such a manner that the cross-sectional modification of the discharge channels **3** obtained thereby makes it exactly possible to achieve the desired effect on the air flow. The radial rotor **18** is preferably manufactured from a metal which can be processed by means of the die-casting method, such as, for example, aluminum, zinc alloys, or like materials.

In FIG. **6**, there is shown another embodiment of a radial rotor **23** in a cross-sectional view with the section taken close to the lower end of the deflecting lobe **4**. In this embodiment, the vanes **24** are curved in the manner of turbine vanes. The connection with the projectile parts can be effected in the same manner as shown in FIG. **4**, but, of course, can also be accomplished in another conventional manner.

In accordance with the above-described features and principles of operation, a spin-stabilized training projectile having a desired shortened range may be produced. An example of such a projectile is a projectile having the caliber $D_2 = 105$ mm., a muzzle velocity of approximately 800 m./sec., and a peripheral speed at the muzzle of the weapon of approximately 30 m./sec. which is in the same order of magnitude as a rotary compressor. The pressure difference between the tip of the projectile and the cylindrical zone of the jacket of the projectile has, depending on the configuration of the tip, an upper limit of approximately 1kp./cm^2. This projectile was designed to fall below the stability limit after approximately 1,500 meters of firing range and then to descend to the ground as quickly as possible. On the basis of predetermined calculations based on the principles of rotary compressors, the projectile was constructed in accordance with FIGS. **2** and **3** to have four bores for the discharge channels **16, 17**. Each channel had a diameter of 12.5 mm. and a bend angle of 45° with the inside diameter D_1 of the central bore **2** being 30 mm. In practice firing tests with this projectile, photographic records of the flight path of the projectile disclosed deviations after approximately 1,500 meters as a result of the projectile becoming unstable in flight, thereby providing the required shortening of the maximum range of the projectile.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings. It should therefore be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

We claim:

1. Training ammunition comprising a projectile having a spin stabilized flight upon launching from a barrel of a weapon and spin-braking means arranged in said projectile serving as a rotary compressor with radial rotors for braking the spin stabilized flight of said projectile to reduce the maximum flight range thereof, said spin-braking means including a central bore extending from the tip of said projectile partially therethrough, said central bore having the rear portion thereof in communication with the outer surface of said projectile via discharge channels arranged about said central bore, whereby the spin stabilized flight of said projectile is braked by the flow of air through said central bore and said discharge channels.

2. Training ammunition as defined in claim **1**, wherein said central bore and said discharge channels are provided with inner cross sections of predetermined size in accordance with the flight characteristics of said projectile to provide a predetermined braking effect on said projectile.

3. Training ammunition as defined in claim **2**, wherein said discharge channels have an entrance opening at said central bore and an exit opening at the outer surface of said projectile, said exit opening being at an angular inclination with respect to said entrance opening.

4. Training ammunition as defined in claim **3**, wherein the angular inclination of said exit opening is in the spin direction of said projectile.

5. Training ammunition as defined in claim **1**, wherein said discharge channels are symmetrically arranged about said central bore.

6. Training ammunition as defined in claim **5**, wherein said discharge channels have center lines lying in a plane substantially transverse to the axis of said central bore.

7. Training ammunition as defined in claim **6**, wherein said projectile is of a predetermined caliber and said central bore is provided with an inside diameter of between approximately 10 percent and 40 percent of said predetermined caliber.

8. Training ammunition as defined in claim **7**, wherein said discharge channels have an entrance opening at said central bore and the total entrance cross section of the combined discharge channels is larger by at least approximately 20 percent than the inside cross section of said central bore.

9. Training ammunition as defined in claim **8**, wherein said projectile has a cylindrical portion and said discharge channels have an exit opening at the outer surface of said projectile in the cylindrical portion thereof.

10. Training ammunition as defined in claim **9**, wherein said projectile is provided with a predetermined center of gravity thereof and said discharge channels are disposed approximately in the region of the cross-sectional plane determined by said center of gravity.

11. Training ammunition as defined in claim 10, wherein said projectile includes at least a first and second part joined together in the region of said discharge channels, said first part being provided with a lug portion and said second part being provided with a recess portion for receiving said lug portion, each of said discharge channels being formed as two partial bores, one of said bores being provided in the lug portion of said first part and the other bore being provided in the wall of said recess portion of said second part.

12. Training ammunition as defined in claim 11, wherein said two bores are at an angular inclination with respect to each other.

13. Training ammunition as defined in claim 12, wherein said central bore is provided at the rear end thereof with a deflecting lobe having a cross section which increases rearwardly in the flow direction.

14. Training ammunition as defined in claim 13, wherein said deflecting lobe is provided with a concave surface for directing the air flow into said discharge channels.

15. Training ammunition as defined in claim 1, wherein said projectile is of a predetermined caliber and said central bore is provided with an inside diameter of between approximately 10 percent and 40 percent of said predetermined caliber.

16. Training ammunition as defined in claim 15, wherein said discharge channels have an entrance opening at said central bore and the total entrance cross section of the combined discharge channels is larger by at least approximately 20 percent than the inside cross section of said central bore.

17. Training ammunition as defined in claim 15, wherein said projectile includes at least a first and second part joined together in the region of said discharge channels, said first part being provided with a lug portion and said second part being provided with a recess portion for receiving said lug portion, each of said discharge channels being formed as two partial bores, one of said bores being provided in the lug portion of said first part and the other bore being provided in the wall of said recess portion of said second part.

18. Training ammunition as defined in claim 17, wherein said two bores are at an angular inclination with respect to each other.

19. Training ammunition as defined in claim 18, wherein said central bore is provided at the rear end thereof with a deflecting lobe having a cross section which increases rearwardly in the flow direction.

20. Training ammunition as defined in claim 19, wherein said deflecting lobe is provided with a concave surface for directing the air flow into said discharge channels.

21. Training ammunition as defined in claim 15, wherein said projectile is provided with a first part having said central bore therein and said discharge channels are provided in a second part adapted for connection with said first part in the region of the rear end of said central bore.

22. Training ammunition as defined in claim 16, wherein said projectile has a cylindrical portion and said discharge channels have an exit opening at the outer surface of said projectile in the cylindrical portion thereof.

23. Training ammunition as defined in claim 22, wherein said projectile is provided with a predetermined center of gravity thereof and said discharge channels are disposed approximately in the region of the cross-sectional plane determined by said center of gravity.

24. Training ammunition as defined in claim 23, wherein said discharge channels are symmetrically arranged about said central bore.

25. Training ammunition as defined in claim 16, wherein said projectile includes at least a first and second part joined together in the region of said discharge channels, said first part being provided with a lug portion and said second part being provided with a recess portion for receiving said lug portion, each of said discharge channels being formed as two partial bores, one of said bores being provided in the lug portion of said first part and the other bore being provided in the wall of said recess portion of said second part.

26. Training ammunition as defined in claim 25, wherein said two bores are at an angular inclination with respect to each other.

27. Training ammunition as defined in claim 26, wherein said central bore is provided at the rear end thereof with a deflecting lobe having a cross section which increases rearwardly in the flow direction.

28. Training ammunition as defined in claim 27, wherein said deflecting lobe is provided with a concave surface for directing the air flow into said discharge channels.

29. Training ammunition as defined in claim 16, wherein said projectile is provided with a first part having said central bore therein and said discharge channels are provided in a second part adapted for connection with said first part in the region of the rear end of said central bore.

30. Training ammunition as defined in claim 1, wherein said projectile has a cylindrical portion and said discharge channels have an exit opening at the outer cylindrical surface of said projectile in the cylindrical portion thereof.

31. Training ammunition as defined in claim 30, wherein said projectile is provided with a first part having said central bore therein and said discharge channels are provided in a second part adapted for connection with said first part in the region of the rear end of said central bore.

32. Training ammunition as defined in claim 1, wherein said projectile is provided with a predetermined center of gravity thereof and said discharge channels are disposed approximately in the region of the cross-sectional plane determined by said center of gravity.

33. Training ammunition as defined in claim 32, wherein said projectile includes at least a first and second part joined together in the region of said discharge channels, said first part being provided with a lug portion and said second part being provided with a recess portion for receiving said lug portion, each of said discharge channels being formed as two partial bores, one of said bores being provided in the lug portion of said first part and the other bore being provided in the wall of said recess portion of said second part.

34. Training ammunition as defined in claim 33, wherein said two bores are at an angular inclination with respect to each other.

35. Training ammunition as defined in claim 34, wherein said central bore is provided at the rear end

thereof with a deflecting lobe having a cross section which increases rearwardly in the flow direction.

36. Training ammunition as defined in claim 35, wherein said deflecting lobe is provided with a concave surface for directing the air flow into said discharge channels.

37. Training ammunition as defined in claim 32, wherein said projectile is provided with a first part having said central bore therein and said discharge channels are provided in a second part adapted for connection with said first part in the region of the rear end of said central bore.

38. Training ammunition as defined in claim 1, wherein said projectile includes at least a first and second part joined together in the region of said discharge channels, said first part being provided with a lug portion and said second part being provided with a recess portion for receiving said lug portion, each of said discharge channels being formed as two partial bores, one of said bores being provided in the lug portion of said first part and the other bore being provided in the wall of said recess portion of said second part.

39. Training ammunition as defined in claim 38, wherein said two bores are at an angular inclination with respect to each other.

40. Training ammunition as defined in claim 1, wherein said projectile is provided with a first part having said central bore therein and said discharge channels are provided in a second part adapted for connection with said first part in the region of the rear end of said central bore.

41. Training ammunition as defined in claim 40, wherein said second part is provided with a deflecting lobe having a cross section which increases rearwardly in the flow direction, said deflecting lobe being disposed on said part at the junction of said discharge channels and adapted to be arranged along the axis of the central bore at the rear end thereof.

42. Training ammunition as defined in claim 41, wherein said deflecting lobe is provided with a concave surface for directing the air flow into said discharge channels.

43. Training ammunition as defined in claim 1, wherein said central bore is provided at the rear end thereof with a deflecting lobe having a cross section which increases rearwardly in the flow direction.

44. Training ammunition as defined in claim 43, wherein said deflecting lobe is provided with a concave surface for directing the air flow into said discharge channels.

45. Training ammunition as defined in claim 1, wherein said discharge channels have an entrance opening at said central bore and the total entrance cross section of the combined discharge channels is larger by at least approximately 20 percent than the inside cross section of said central bore.

46. Training ammunition as defined in claim 1, wherein said projectile is provided with a first part having said central bore therein, said first part having a cylindrical portion with apertures arranged in the region of the rear end of said central bore and extending to the outer cylindrical surface of said projectile, and a second part having discharge channels adapted for connection with said first part in the region of the rear end of said central bore, each of said discharge channels being arranged for communication with a corresponding aperture of said first part for directing the air flow from said central bore into said corresponding aperture.

47. Training ammunition as defined in claim 46, wherein said second part is provided with a deflecting lobe having a cross section which increases rearwardly in the flow direction, said deflecting lobe being disposed on said part at the junction of said discharge channels and adapted to be arranged along the axis of the central bore at the rear end thereof.

48. Training ammunition as defined in claim 47, wherein said deflecting lobe is provided with a concave surface for directing the air flow into said discharge channels.

49. Training ammunition as defined in claim 48, wherein said discharge channels are formed by radially extending vanes.

50. Training ammunition as defined in claim 49, wherein the height of the vanes decreases and the distance between adjacent vanes increases in the outward radial direction.

51. Training ammunition as defined in claim 49, wherein said vanes are curved in the outward radial direction.

52. Training ammunition as defined in claim 51, wherein the height of the vanes decreases and the distance between adjacent vanes increases in the outward radial direction.

53. Training ammunition as defined in claim 1, wherein said projectile includes a first part having said central bore therein, said first part having a cylindrical portion having apertures arranged about the periphery thereof in the region of the rear end of said central bore, a second part connected to said first part, and a third part forming said discharge channels being positioned on said second part in the region of the rear end of said central bore and arranged for communication with said apertures of said first part for directing the air flow from said central bore into said apertures.

54. Training ammunition as defined in claim 53, wherein said third part is a radial rotor member connected with said second part.

55. An arrangement for training ammunition comprising a projectile, a weapon for launching said projectile and imparting a rotation to said projectile so as to provide a spin stabilized flight of said projectile, said projectile including braking means for applying rotation retarding forces to said spin stabilized projectile so as to brake the spin stabilized flight of said projectile and making said projectile unstable thereby limiting the maximum flight range of said projectile.

56. An arrangement as defined in claim 55, wherein said braking means is arranged within said projectile and includes a central bore extending from the tip of said projectile partially therethrough, said central bore having the rear portion thereof in communication with the outer surface of said projectile via discharge channels arranged about said central bore, whereby the spin stabilized flight of said projectile is retarded by the flow of air through the central bore and the discharge channels.

57. A method for controlling the flight range of spin stabilized projectiles for training purposes comprising the steps of launching a projectile, imparting a rotation to the projectile so as to provide a spin stabilized flight for the projectile, and applying a spin retarding force to the spin stabilized projectile to break the rotation of

the projectile so as to render the projectile unstable within the normal maximum range of the projectile.

58. A method as defined in claim **57**, wherein the step of imparting a rotation to the projectile includes the step of spinning the projectile in a first direction to effect a spin stabilized flight thereof and the step of applying a retarding force includes the step of applying a force component in a direction in opposition to the first direction.

59. A method as defined in claim **57**, wherein the projectile includes a central bore extending from the tip of the projectile partially therethrough, the central bore having the rear portion thereof in communication with the outer surface of the projectile via discharge channels arranged about the central bore, the step of applying a retarding force including the directing of the air flow through the central bore and the discharge channels to brake the spin stabilized flight of the projectile.

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