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SABOT WITH INTERNAL RADIAL SLOTS

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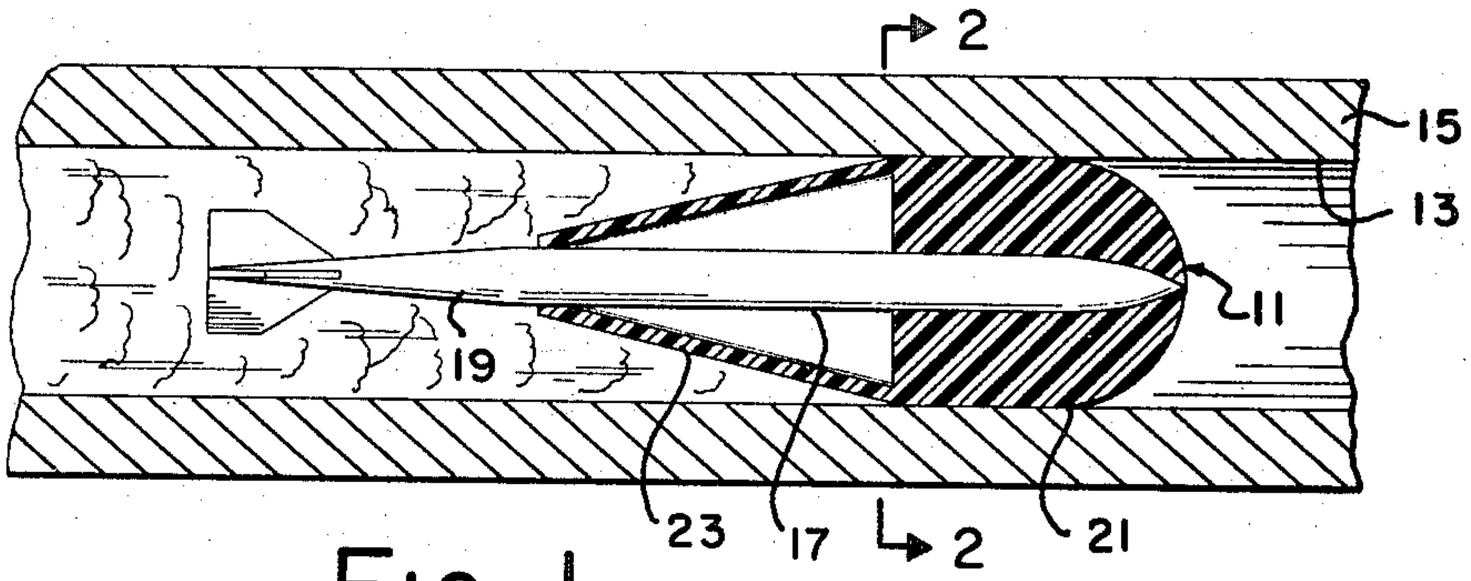

FIG. 1

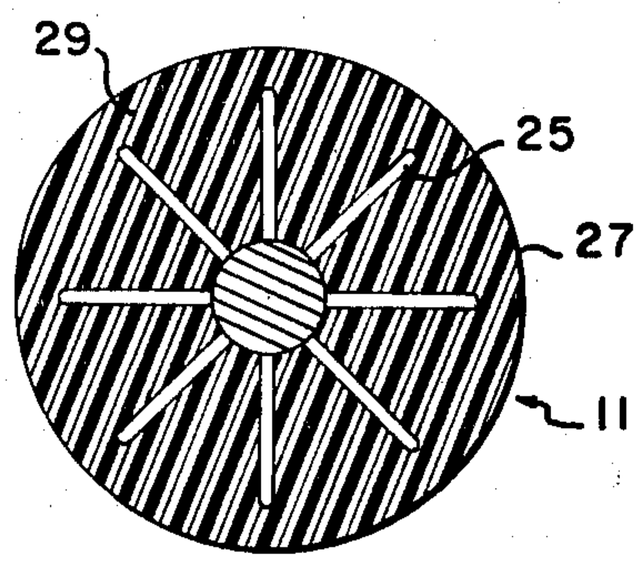

FIG. 2

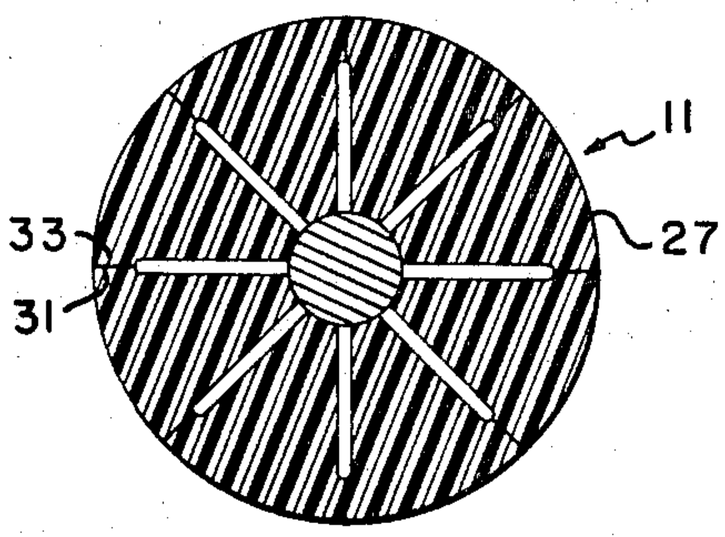

FIG. 3

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SABOT WITH INTERNAL RADIAL SLOTS

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ABSTRACT OF THE DISCLOSURE

A sabot is disclosed having a cylindrical portion adapted to position the sabot in a gun barrel, an axial bore containing a projectile, and a conical portion having a plurality of longitudinal slots extending radially from the axial bore towards the exterior surface, thereby forming a plurality of wedge-shaped segments. As a high pressure gas propels the sabot and the projectile through the gun barrel, the gas exerts a force in the surface of the conical portion of the sabot which is transmitted through the wedge-shaped segments to the projectile so as to create a frictional force between the apex of the wedge-shaped segments, the sabot and the surface of the projectile which is sufficient to enable the sabot to pull the projectile along therewith.

This invention relates to sabot arrangements for producing high muzzle velocities in projectiles and more particularly to a sabot adapted to constrict around and frictionally grip the projectile as a function of propelling gas pressure as the sabot and projectile travel through the gun barrel so that it is not necessary to provide positive locking means to fasten the sabot to the projectile, thus providing a clean aerodynamic surface when the sabot is removed upon the projectile leaving the gun barrel.

It is well known that the velocity imparted to the projectile being propelled through a gun barrel may be increased by providing a relatively lightweight body of large diameter having an axial bore, and commonly known as a sabot, into which a relatively heavy projectile is inserted to increase the area on which the propelling gas pressure acts so as to increase the total force propelling the projectile through a gun barrel. In prior U.S. Patent No. 2,939,395, a sabot is constructed of a resilient material, such as plastic or fiber glass, and utilizes the propelling gas pressure in the gun barrel to constrict a portion of the sabot around the projectile to create a frictional force between the axial bore of the sabot and the surface of a finned cylindrical projectile that enables the sabot to pull the projectile through the gun barrel. Upon leaving the gun barrel, the pressure is removed, which in turn removes the frictional force between the sabot and the projectile to enable the sabot to be removed from the projectile.

However, oftentimes the constriction of the resilient sabot is resisted by the lateral and other compressive forces in the material to such an extent that the frictional force exerted by the bore of the sabot against the surface of the projectile is insufficient to prevent a relative axial movement between the sabot and the projectile, thus reducing the propelling force transferred from the sabot to the projectile and consequently the velocity imparted to the projectile. This is much more apt to occur as the sabot approaches the muzzle of the gun barrel, because the pressure exerted on the sabot by the propelling gas is greatly reduced as the sabot travels through the barrel. Although it is sometimes possible to extend the length of the frusto-conical portion of the sabot so that the axial bore of the sabot engages a greater surface area of the projectile and thus increases the frictional force between the sabot and the projectile, this is not always desirable because the increased volume of the sabot reduces the amount of propellant which can be contained in a cartridge of a given size and accordingly reduces the amount of the propelling gas pressure created by the ignition of the propellant.

Accordingly, it is a feature of the present invention to provide an improved sabot constructed from a resilient material which substantially reduces the circumferentially lateral and other compressive forces in the constricted portion of the sabot, yet enables the propelling gas to exert a maximum force against the projectile so as to create a frictional force between the bore of the sabot and the surface of the projectile which is sufficient to prevent a relative axial movement between the sabot and the projectile.

In the present invention, the sabot has a frusto-conical portion adapted to be constricted with partial longitudinal relief slots extending radially from the bore to within a short distance of the exterior surface of the frusto-conical portion so as to form wedge-shaped segments, and relieve the compressive forces in the frusto-conical portion of the sabot. Two embodiments are disclosed, one having the segments integrally connected at their outer annular edges and the other embodiment having the segments contiguous but separate along at least their intermediate length. A high pressure propelling gas exerts a force over the surface of the frusto-conical portion of the sabot which is transmitted through the wedge-shaped segments to the projectile so as to create a frictional force between the interior portions of the segments and the surface of the projectile which is sufficient to prevent a relative axial movement between the sabot and the projectile, and thus enable the sabot to impart a maximum propelling force to the projectile.

Still other objects, features, and attendant advantages will become apparent to those skilled in the art from a reading of the following detailed description of the embodiments constructed in accordance with the invention taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a cross-sectional view showing a projectile and a sabot according to the invention being propelled through the bore of a gun barrel.

FIG. 2 is a sectional view of the sabot of FIGS. 1 and 2, taken along the section line **2—2** of FIG. 1.

FIG. 3 is a sectional view of another embodiment of a sabot according to this invention taken along the section line **2—2** of FIG. 1.

Referring now in detail to the figures of the drawing, in FIG. 1 is shown a relatively lightweight sabot, generally indicated at **11**, being propelled through the bore **13** of a gun barrel **15** by a high pressure gas and having an axial bore **17** containing a relatively heavy, sharp pointed projectile **19**, having straight or canted stabilizing fins at the rearward end that is long with respect to its cross-sectional area so as to increase its mass/cross-sectional area ratio and thus give it increased penetrating power for any given velocity. The sabot **11** may suitably be formed of constrictable materials such as aluminum, glass fiber reinforced resin, or other plastic materials, and has a large diameter cylindrical portion **21** which positions the finned projectile **19** in generally coaxial alignment with the gun barrel **15** and engages the bore **13** in a sealing fit so as to prevent the propelling gas from leaking around the sabot **11** and thus enabling it to impart a maximum velocity to the projectile **19**. Although the sabot **11** herein disclosed is especially useful with the illustrated type of projectile **19**, it is to be understood that a sabot **11** constructed in accordance with this invention may be used with other types of projectiles.

The sabot **11** has a frusto-conical portion **23** extend-

ing rearwardly from the cylindrical portion **21** which is adapted to constrict around the projectile **19** and create a frictional force between the axial bore **17** of the sabot **11** and the surface of the projectile **19** so as to prevent a relative axial movement between the sabot **11** and the projectile **19**. The frusto-conical portion **23** has a plurality of longitudinal slots **25** extending radially from the axial bore **11** to within a short distance of the exterior surface so as to form a plurality of wedge-shaped segments **27** interconnected at their outer edges to form an integral circumferential web, generally indicated at **29**, and thereby providing a continuous exterior surface for the propelling high pressure gas to act directly upon.

When the component of force acting perpendicularly to the axis of the bore **13** of the gun barrel **15** is applied against the exterior surfaces of the plurality of flexible, integrally connected wedge-shaped segments **27** to compress them against the surface of the projectile **19**, it radially compresses them and causes a plastic flow of the flexible material into the space occupied by the longitudinal slots **25** to further reduce the compressive forces resisting the constriction of the frusto-conical portion **23** of the sabot **11** and consequently increase the frictional force enabling the sabot **11** to pull the projectile **19** through the gun barrel **15**. As a result, the force transmitted through each wedge-shaped segment **27** to the projectile **19** closely approaches the product of the gas pressure and the effective arcuate area of the circumferential web **29** between the radial centers of two adjacent slots **25**.

In FIG. 3 is a sectional view of an alternative embodiment of a sabot **11** constructed according to this invention and having the same general configuration as the sectional view shown in FIG. 2, but with relief cuts **31** extending radially from the longitudinal slots **25** to the exterior surface of the frusto-conical portion **23** of the sabot **11** so as to form a plurality of flexible, but separate, wedge-shaped segments **27**.

When the component of force, acting perpendicularly to the axis of the bore **13** of the gun barrel **15**, is applied to the plurality of flexible, but separate, wedge-shaped segments **27** to compress them against the surface of the projectile **19** it causes the relatively small angularly protruding contiguous shoulders **33** of the corners of the segments along the relief cuts **31** to plastically compress, enabling a substantial construction of the frusto-conical portion **23** of the sabot **11** and consequently provide a very substantial frictional force enabling the sabot **11** to pull the projectile **19** through the gun barrel **15**. Since the shoulders **33** are squeezed tightly together as the frusto-conical portion **23** is constricted around the projectile **19**, the longitudinally extending slots **25** are substantially sealed from the high pressure propelling gas, thus alleviating possible reduction of the component of force acting perpendicularly to the axis of the bore **13** of the barrel **15** by gas pressure from excessive gas entry into the slots **25**. As a result, the force transmitted through each wedge-shaped segment **27** to the projectile **19** closely approaches the product of the gas pressure and the effecture arcuate area of the wedge-shaped segment **27**.

That which is claimed is:

1. In a sabot arrangement adapted to engage the bore of a barrel and including a sabot body of constrictible material, a bore formed in said sabot body for carrying a smooth cylindrical surfaced projectile, and a rearward portion adapted to be radially constricted and exert a frictional projectile-retaining force through the wall surface forming said bore in response to propellant gas pressure applied to the circumferentially exterior surface of the rearward portion of the sabot in propelling the sabot through the bore of a barrel, the improvement comprising:

said sabot having at its rearward zone a plurality of circumferential wedge-shaped segments directly interconnecting at their radially outer zones and spaced apart at their radially inner zones to form longitudinal slots in the rearward portion of said sabot and extending radially from the bore to within a short distance of the circumferential exterior surface of the sabot to reduce the internal compression-resistive forces developed therein during the constriction of said rearward portion.

2. In a sabot arrangement according to claim **1**, the improvement further comprising:

a cylindrically smooth surfaced projectile disposed and carried within the bore of said sabot and in radial gripping relation by said segments, said segments being spaced apart at the radial gripping junction thereof with said projectile, the radial constriction of said sabot effecting a friction force to enable the sabot to pull the projectile through the bore of the barrel.

3. In a sabot arrangement according to claim **2**, said sabot having a tapered rear surface and said slots formed between said segments being of rearwardly tapering depth toward a zero depth and being closed at their rearward end.

4. In a sabot arrangement according to claim **1**, said wedge-shaped segments being integrally connected as one piece at their adjacent outer arcuate edges and forming a circumferentially continuous surface upon which the propellant gas pressure can be exerted.

5. In a sabot arrangement according to claim **4**, the improvement further comprising:

a cylindrically smooth surfaced projectile disposed and carried within the bore of said sabot and in radial gripping relation by said segments, said segments being spaced apart at the radial gripping junction thereof with said projectile, the radial constriction of said sabot effecting a friction force to enable the sabot to pull the projectile through the bore of the barrel.

6. In a sabot arrangement according to claim **4**, said sabot having a circumferentially integral section forward of said segmented rear portion of said sabot.

7. In a sabot arrangement according to claim **1**, said wedge-shaped segments having lateral shoulders at their radially outer zone and being disposed in direct linear contiguous relation along said shoulders and in spaced apart relation radially inward of said shoulders and between said shoulders and these radially inner smaller ends of said segments.

8. In a sabot arrangement according to claim **7**, the improvement further comprising:

a cylindrically smooth surfaced projectile disposed and carried within the bore of said sabot and in radial gripping relation by said segments, said segments being spaced apart at the radial gripping junction thereof with said projectile, the radial constriction of said sabot effecting a friction force to enable the sabot to pull the projectile through the bore of the barrel.

9. In a sabot arrangement according to claim **7**, said sabot having a circumferentially integral section immediately forward of said wedge-shaped segments.

10. In a sabot arrangement according to claim **1**, said sabot having a circumferentially integral section forward of said segmented rear portion of said sabot.

References Cited

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ROBERT F. STAHL, *Primary Examiner.*