the protective shield already installed on the needle an unacceptable amount that adversely affects sealing of the needle.

Thus, it would be desirable to provide a puller assembly that can overcome one or more of these and other shortcomings of the prior art.

BRIEF SUMMARY OF THE INVENTION

An aspect of the present invention provides a puller assembly mountable to a shield around a needle of a syringe, the shield projecting in an axial direction through an opening in a housing of a device holding the syringe. The puller assembly includes a grip component having a tubular body defining an interior hollow for axially receiving the shield during assembly of the grip component to the shield to form a subassembly. The tubular body includes opposite angular ends defining a slit that extends axially between a first axial end and a second axial end of the tubular body to allow the tubular body to be forcibly shifted from a neutral first arrangement to a radially expanded second arrangement by increasing the angular span of the slit, wherein the interior hollow has a smaller size in the first arrangement and a larger size in the second arrangement. The tubular body includes a radial inner face with at least one radial inward projection for directly engaging the shield in the subassembly. The puller assembly also includes a cap grippable by a user and including a body having a surface defining a cavity into which the grip component is insertable during subsequent assembly of the cap to said subassembly, wherein the cap is configured to hold the inserted grip component and the body surface is configured to limit

radial expansion of the inserted grip component and thereby cause the at least one radial inward projection to be kept in direct engagement with the shield so that when the cap is removed from the housing, it will remove the shield from around the needle.

Another aspect of the present invention provides a method of mounting a puller assembly to a shield around a needle, the shield projecting in an axial direction through an opening in a housing. The method includes the steps of: providing a grip component having a tubular body defining an interior hollow, the tubular body including opposite angular ends defining a slit that extends axially between first and second axial ends of said tubular body, the tubular body including a radial inner face with at least one radial inward projection for directly engaging the shield when said tubular body of said grip component is placed over the shield; forming a subassembly by placing the tubular body around the shield with the tubular body in an radially expanded arrangement in which the slit is larger than when the tubular body is in a neutral arrangement, wherein the shield extends within the interior hollow; allowing a resiliency of the tubular body to cause the tubular body to automatically return toward the neutral arrangement around the shield in said subassembly; and placing a grippable cap onto the grip component such that the tubular body fits within a cavity of the grippable cap so that the grippable cap backs up the grip component, whereby the at least one radial inward projection can engage the shield for removal purposes when the cap is moved from the housing.

One advantage of the present invention is that a puller assembly may be provided which can function within a range of axial tolerances at which the needle shield can be presented for gripping.

Another advantage of the present invention is that a puller assembly may be provided which can be mounted to a needle shield without requiring unacceptably large forces be applied or without adversely affecting a seal around a needle.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other advantages and objects of this invention, and the manner of attaining them, will become more apparent, and the invention itself will be

CLAIMS

WE CLAIM:

1. A puller assembly mountable to a shield around a needle of a syringe, the shield projecting in an axial direction through an opening in a housing of a device holding the syringe, the puller assembly comprising:

a grip component having a tubular body defining an interior hollow for axially receiving the shield during assembly of the grip component to the shield to form a subassembly, said tubular body including opposite angular ends defining a slit that extends axially between a first axial end and a second axial end of said tubular body to allow said tubular body to be forcibly shifted from a neutral first arrangement to a radially expanded second arrangement by increasing the angular span of the slit, said interior hollow having a smaller size in said first arrangement and a larger size in said second arrangement, said tubular body including a radial inner face with at least one radial inward projection for directly engaging the shield in said subassembly; and

a cap grippable by a user and including a body having a surface defining a cavity into which the grip component is insertable during subsequent assembly of the cap to said subassembly, wherein the cap is configured to hold the inserted grip component and the body surface is configured to limit radial expansion of the inserted grip component and thereby cause the at least one radial inward projection to be kept in direct engagement with the shield so that when the cap is removed from the housing, it will remove the shield from around the needle.

10. The puller assembly of Claim 1 wherein said slit extends solely in the axial direction.

11. A method of mounting a puller assembly to a shield around a needle of a syringe, the shield projecting in an axial direction through an opening in a housing, the method comprising:

providing a grip component having a tubular body defining an interior hollow, said tubular body including opposite angular ends defining a slit that extends axially between first and second axial ends of said tubular body, said tubular body including a radial inner face with at least one radial inward projection for directly engaging the shield when said tubular body of said grip component is placed over the shield;

forming a subassembly by placing said tubular body around the shield with said tubular body in a radially expanded arrangement in which said slit is larger than when said tubular body is in a neutral arrangement, wherein the shield extends within said interior hollow;

allowing a resiliency of said tubular body to cause said tubular body to automatically return toward the neutral arrangement around the shield in said subassembly;

placing a grippable cap onto the grip component of said subassembly such that said tubular body fits within a cavity of said grippable cap so that the grippable cap backs up the grip component, whereby said at least one radial inward projection can engage the shield for removal purposes when the cap is moved from the housing.

12. The method of claim 11 wherein the step of placing said tubular body around the shield comprises sliding said tubular body from a first position to a second