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(54) WEAR EDGE ASSEMBLY

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(52) **U.S. Cl.** **37/452**

(57) **ABSTRACT**

A wear assembly for protecting a structure, such as an excavating bucket, from wear includes a lock for securing the wear member in place. The lock includes a take-up element for tightening the fit of the wear member, a latch to retain the lock in the assembly during use, and an arrangement for resisting loosening of the lock. With the assembly, the lock is able to effectively tighten the fit of the wear member on the lip, resist loosening of the fit, and facilitate easy removal of the lock without a concomitant increased risk of lock ejection.

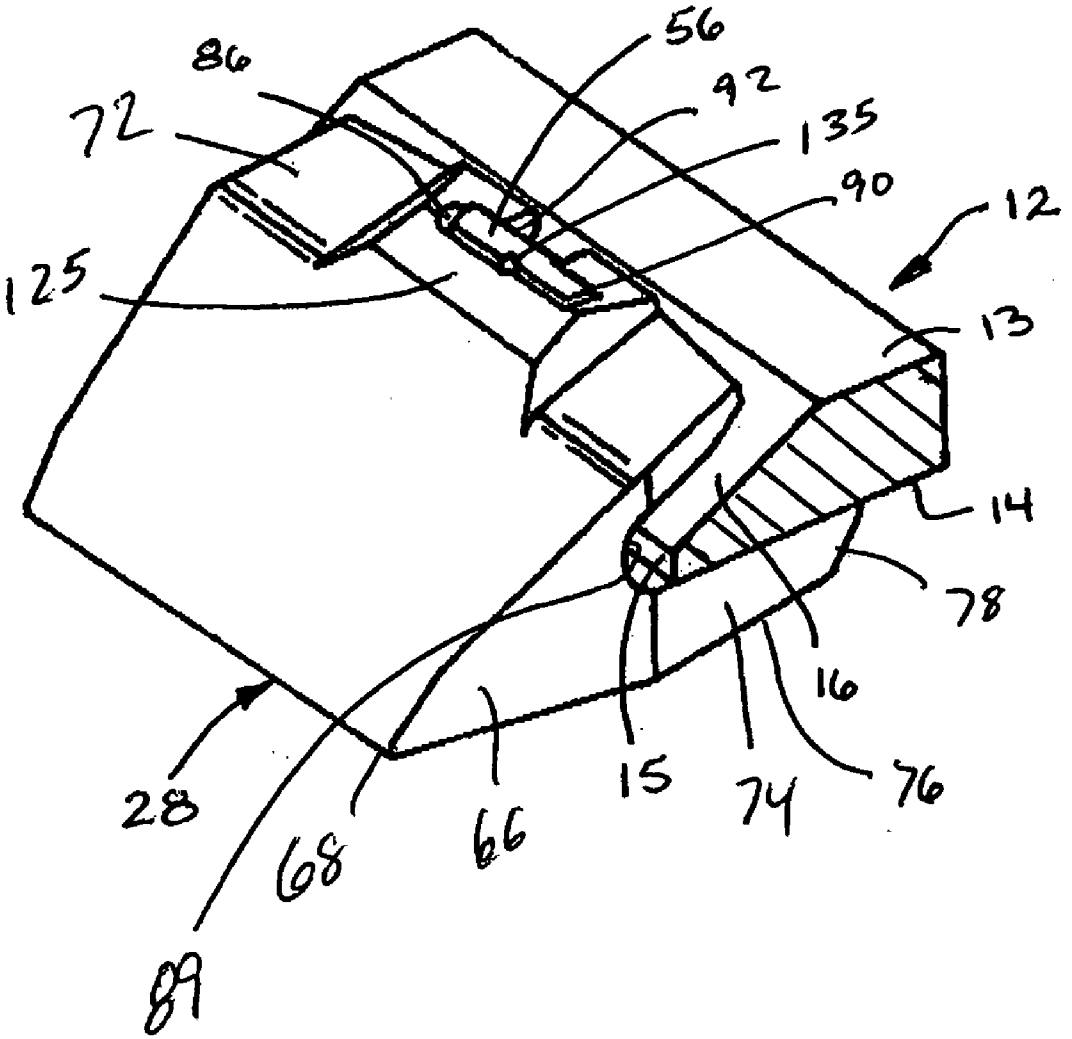


FIG. 1

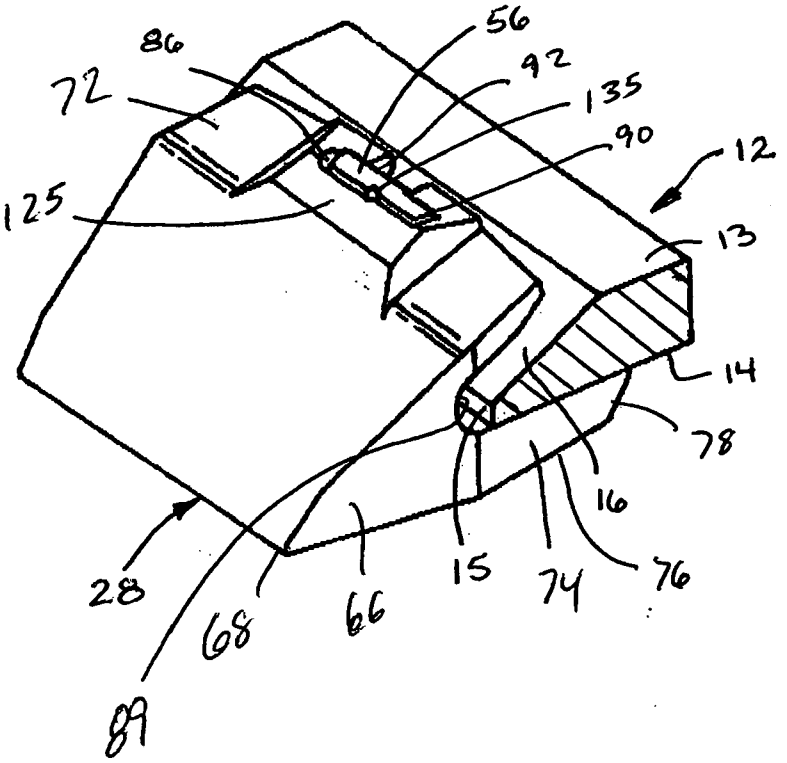
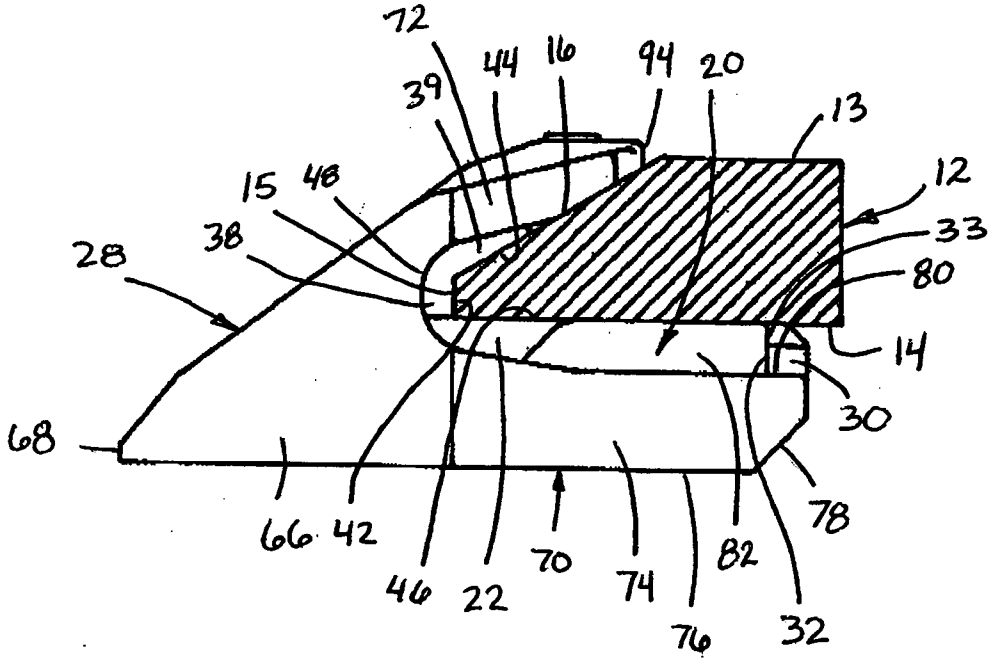

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FIG. 2


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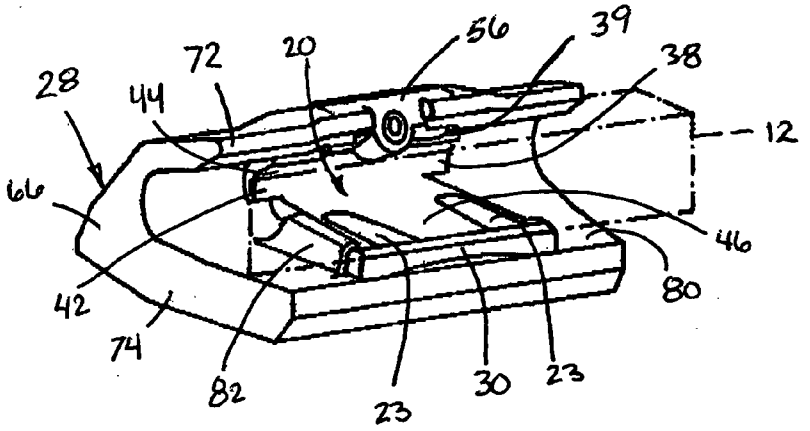

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FIG. 3

FIG. 4

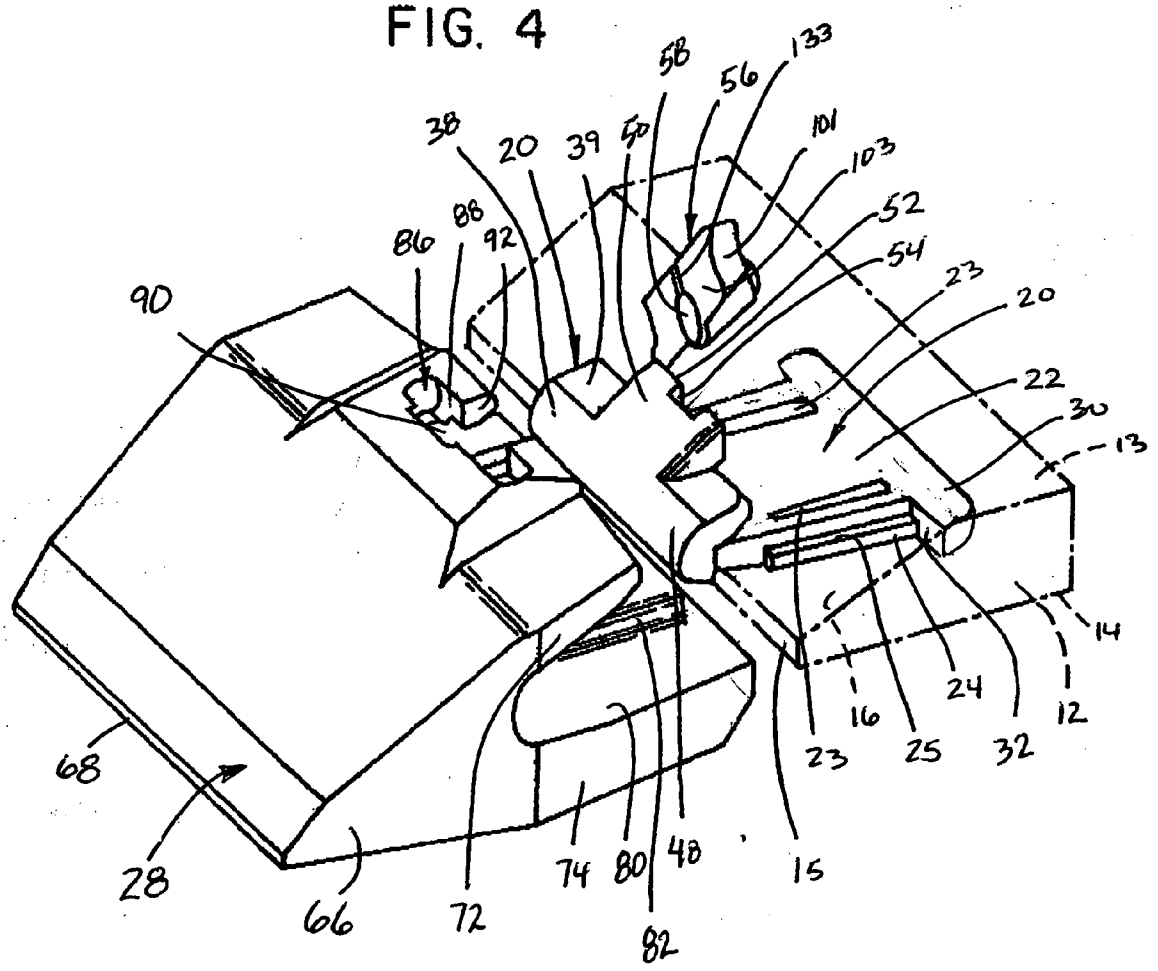

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FIG. 5

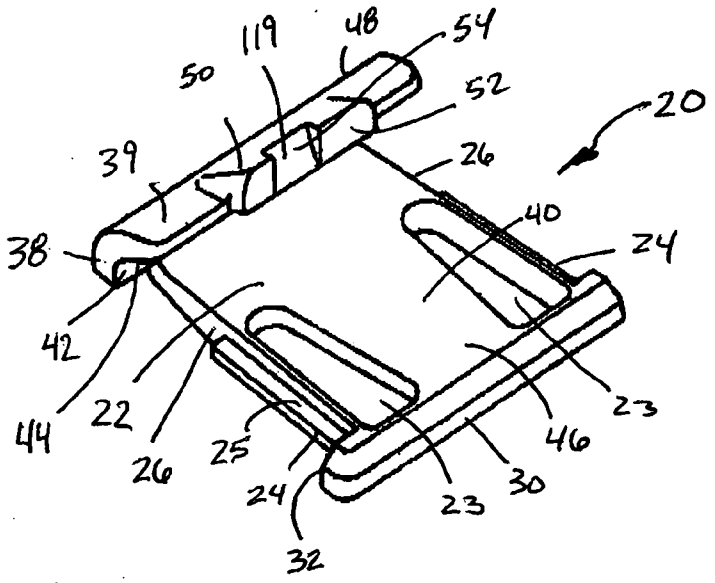

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FIG. 6

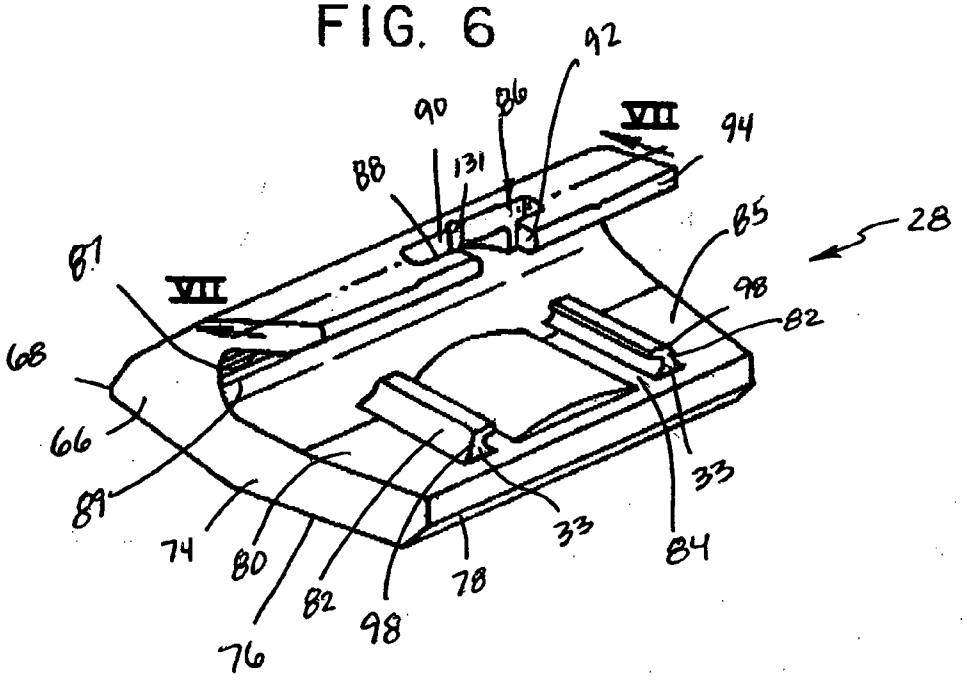

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FIG. 7

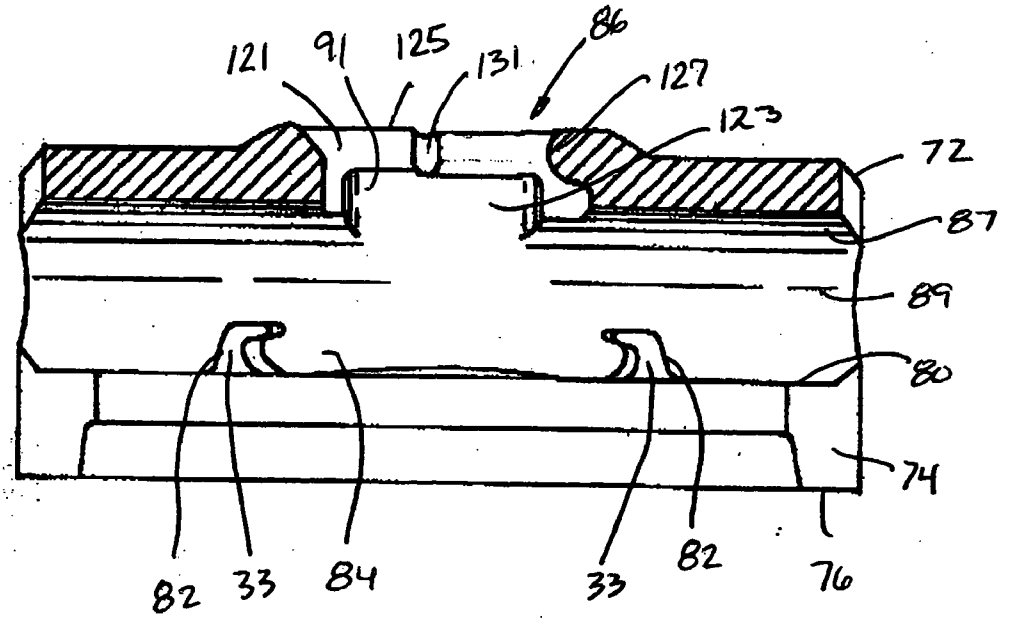

121
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FIG. 8

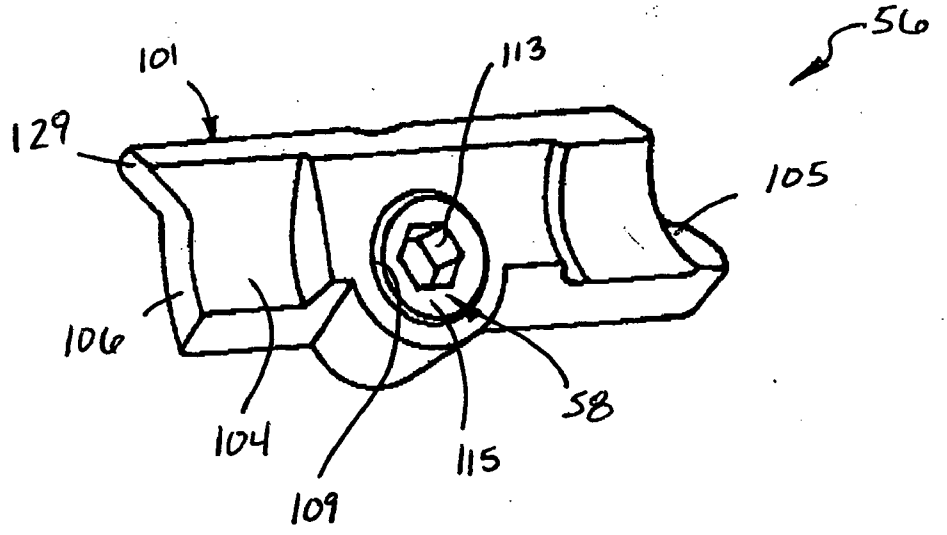

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FIG. 9

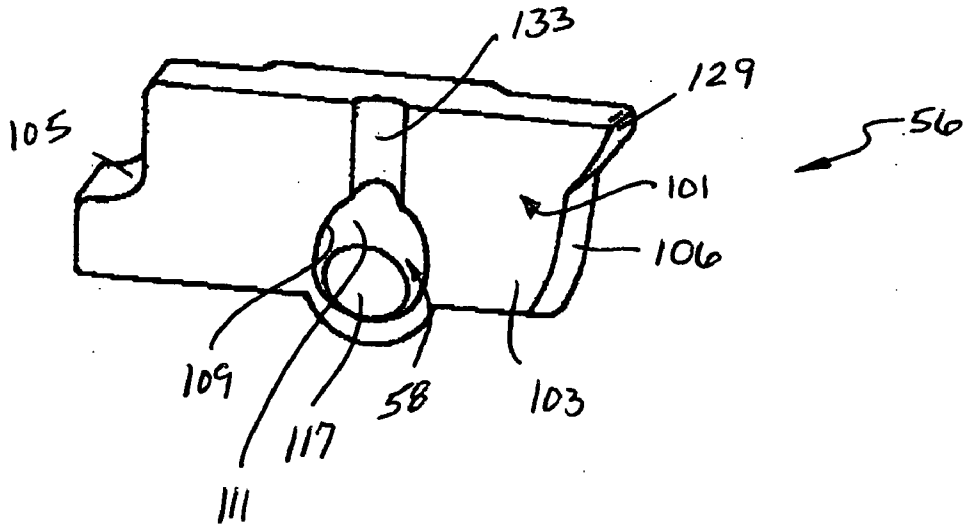

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FIG. 10

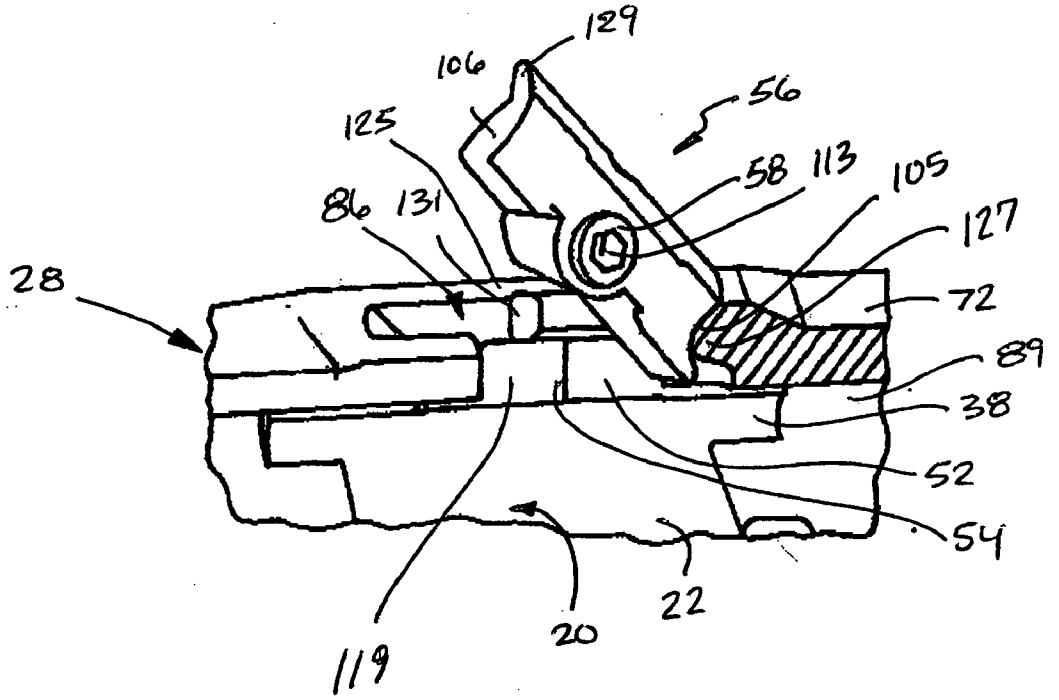

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FIG. 11

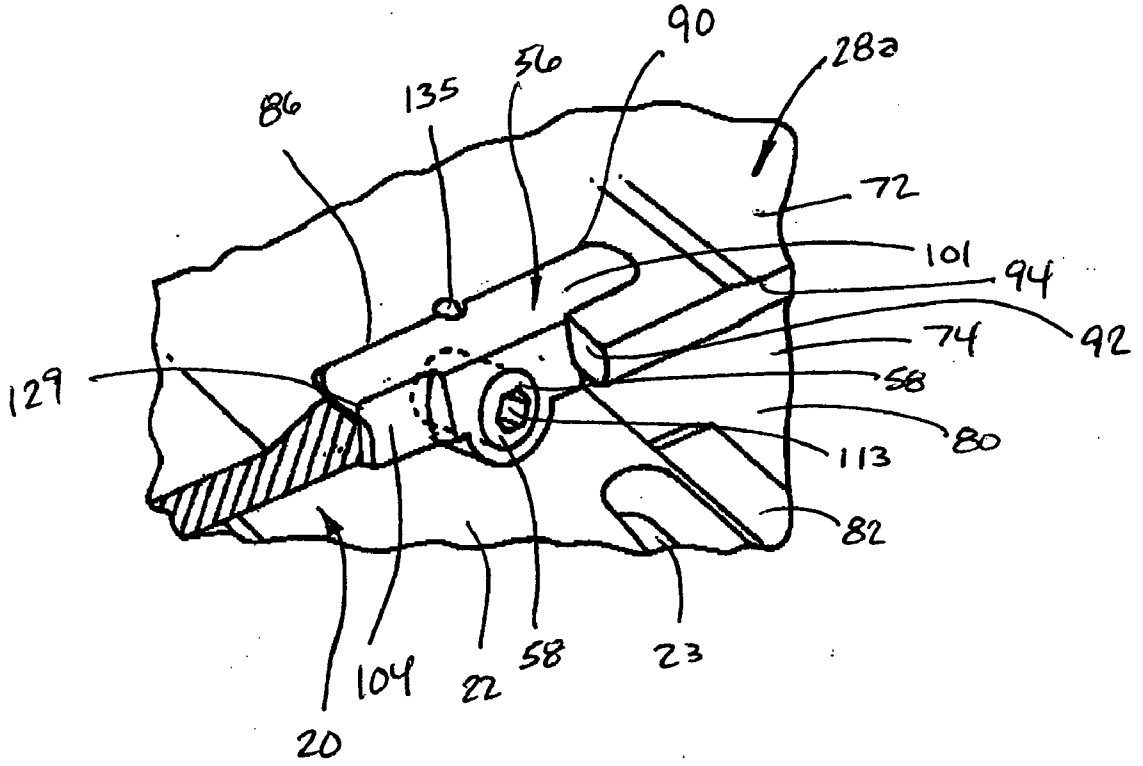

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FIG. 12

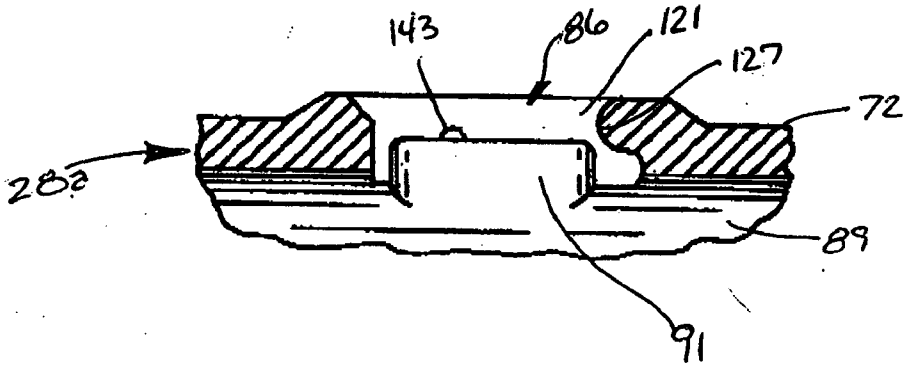

143
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FIG. 13

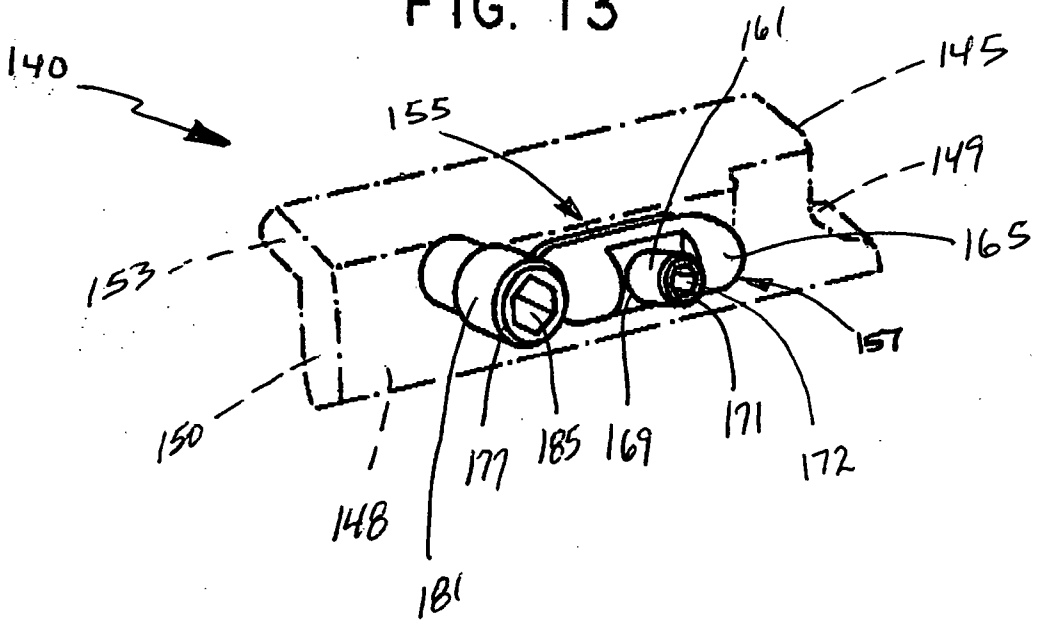

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FIG. 14

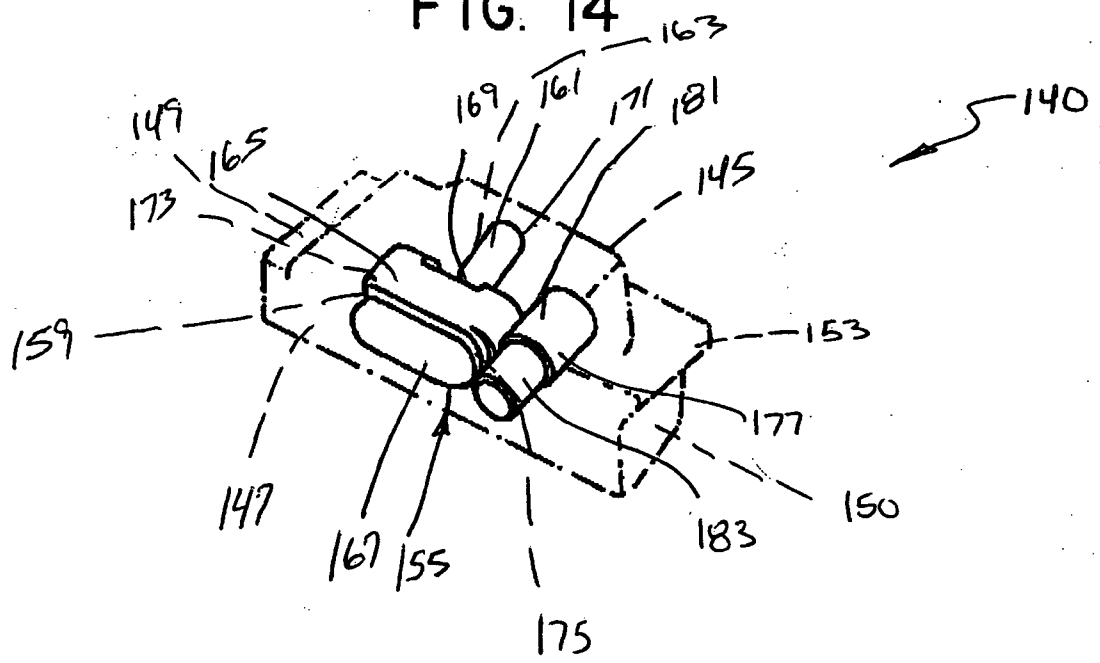

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FIG. 15

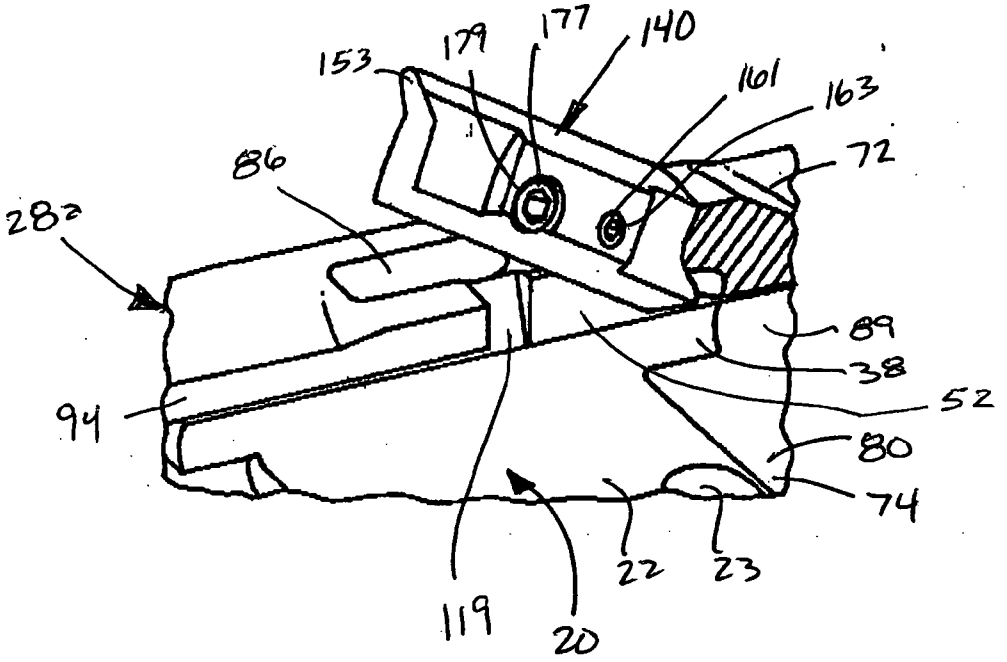

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FIG. 16

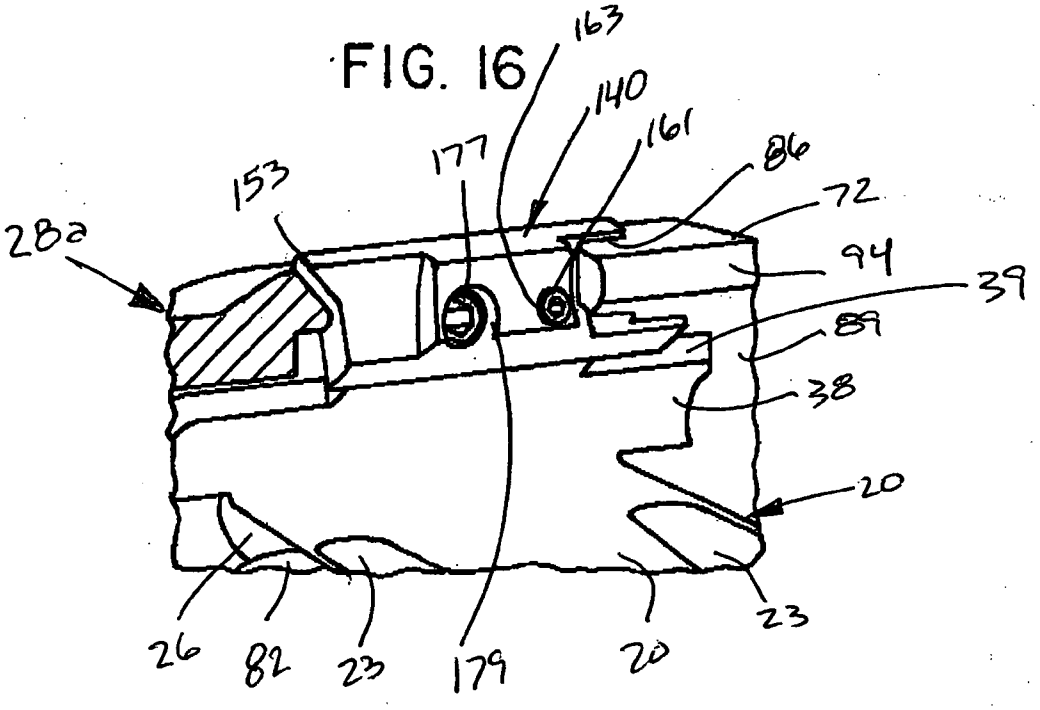

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FIG. 17

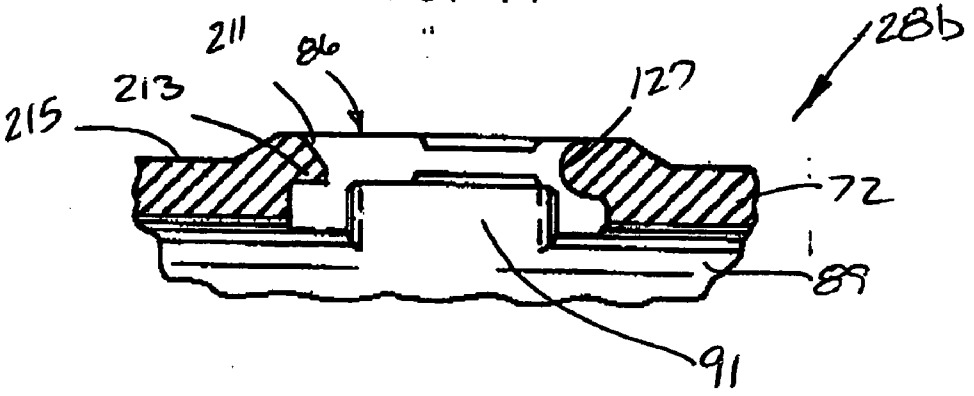

211
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28b
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FIG. 18

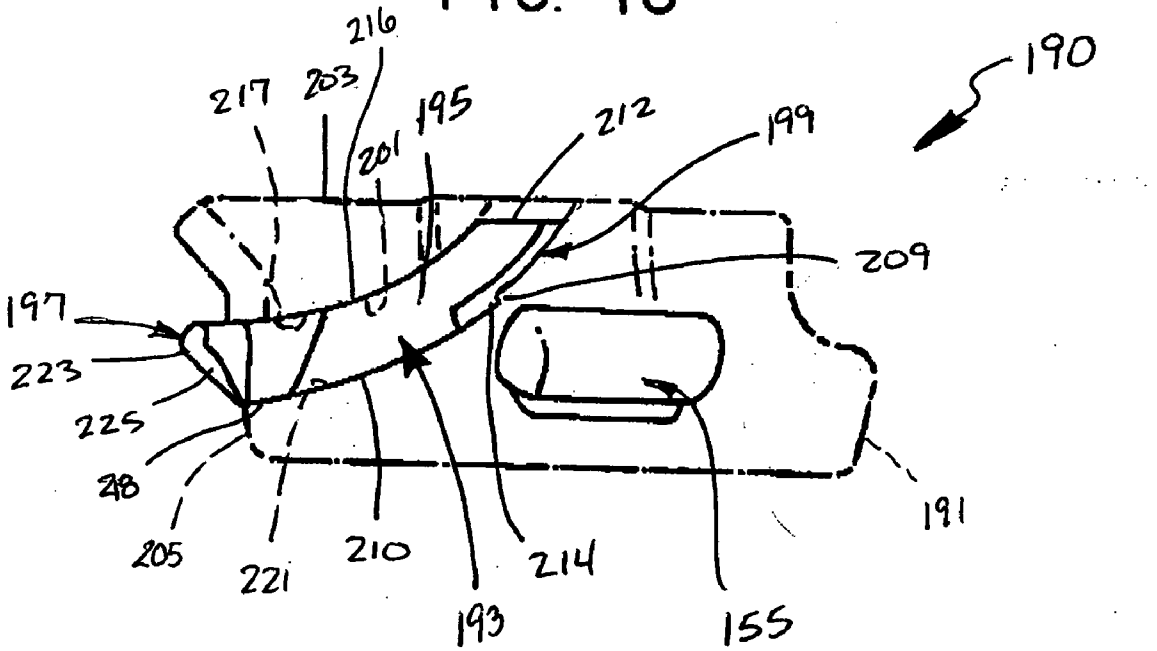

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FIG. 19

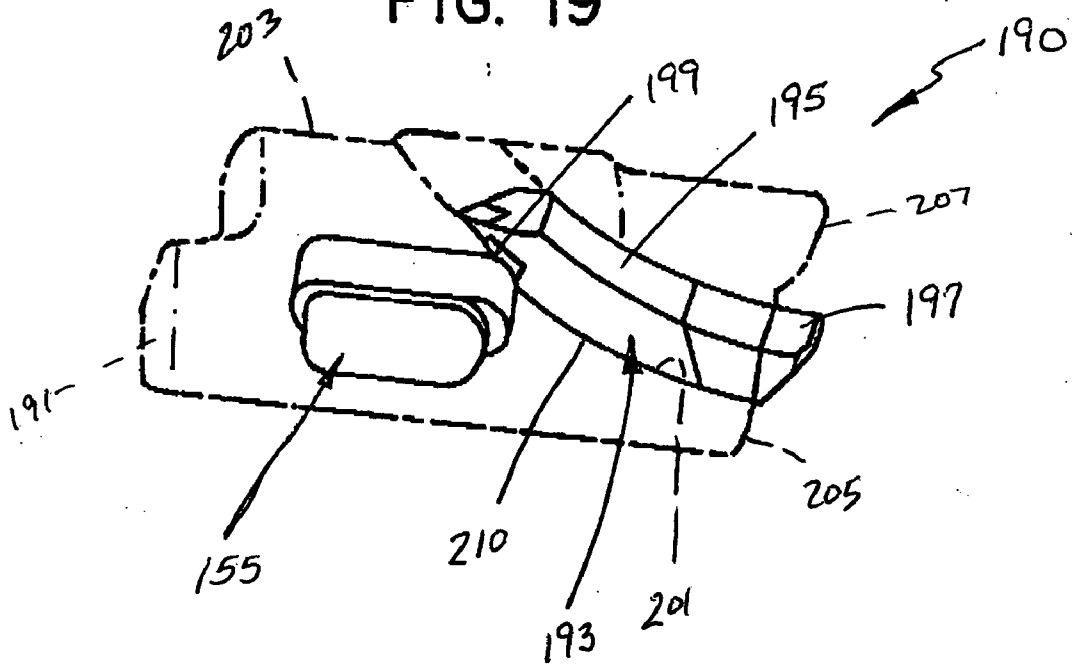

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FIG. 20

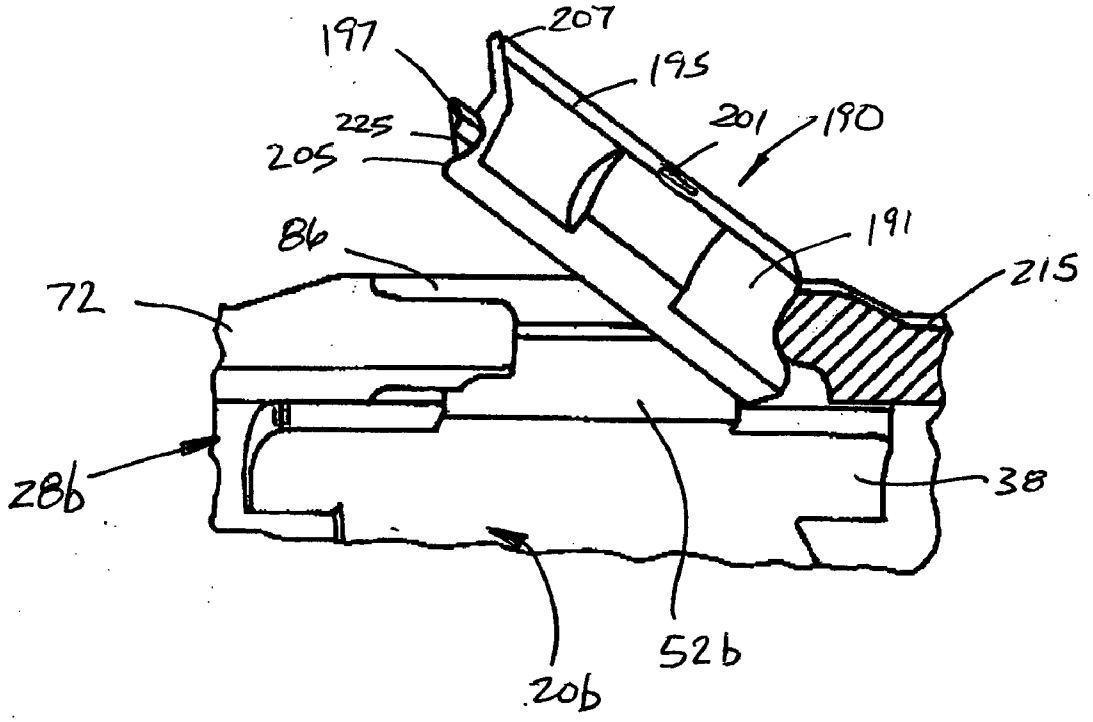

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FIG. 21

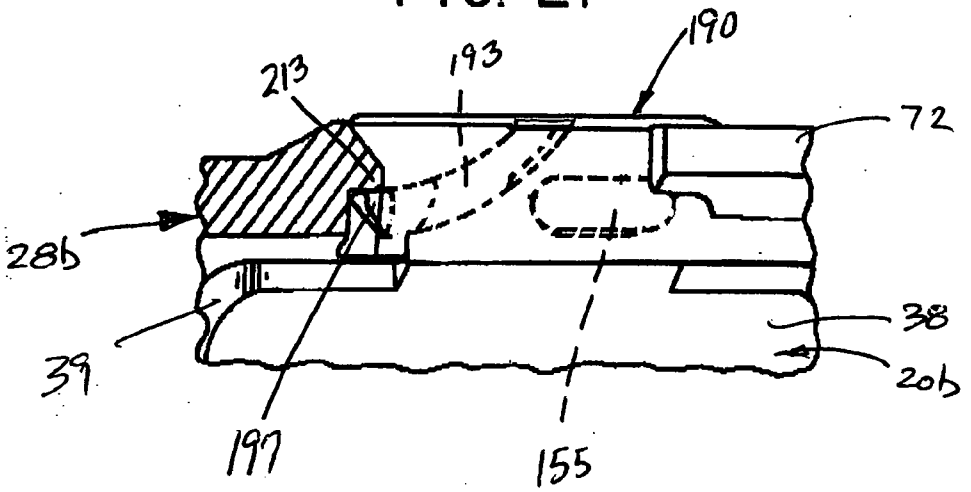

213
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FIG. 22

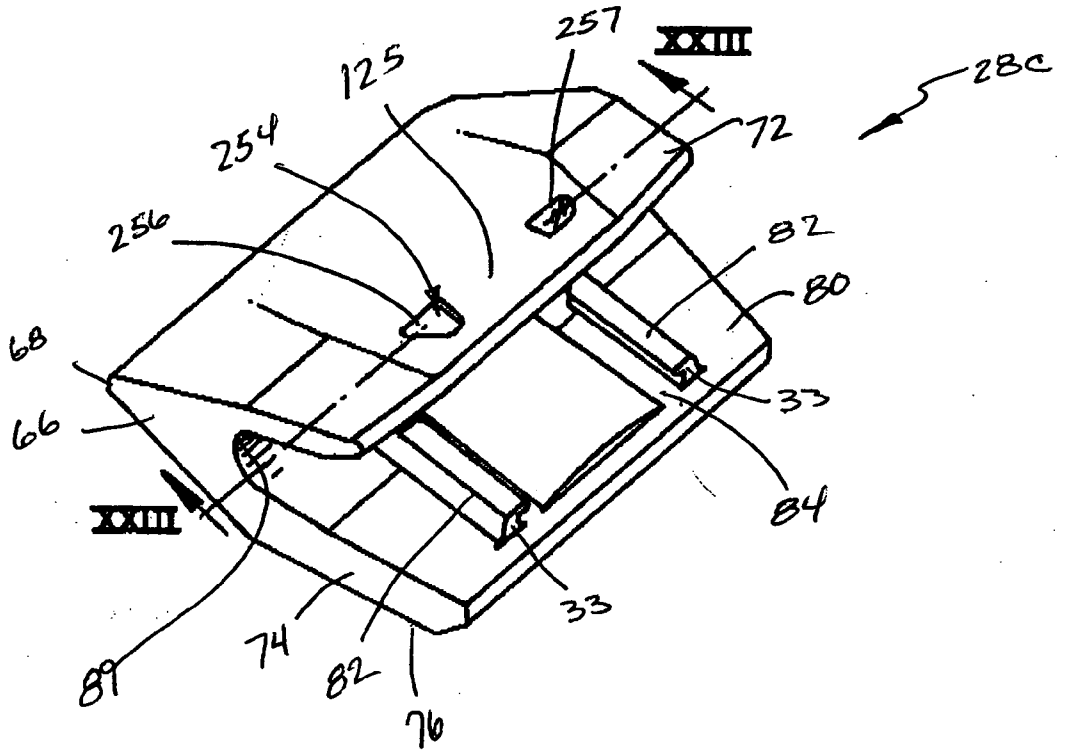

257
XXIII
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XXIII
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FIG. 23

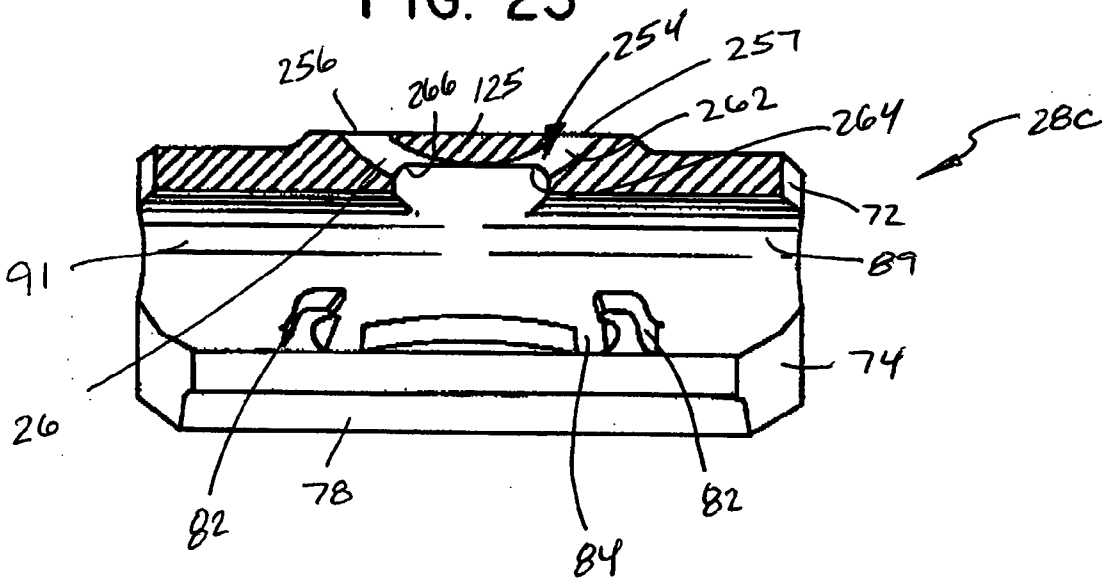

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FIG. 24

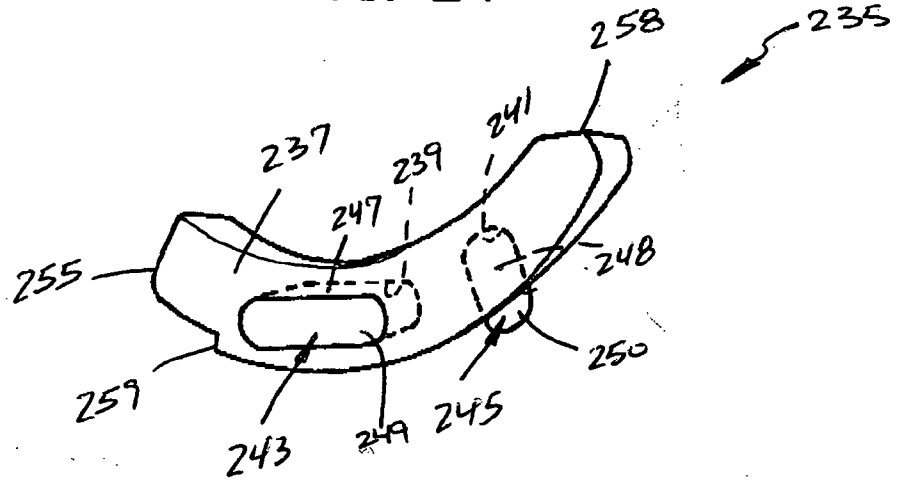

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FIG. 25

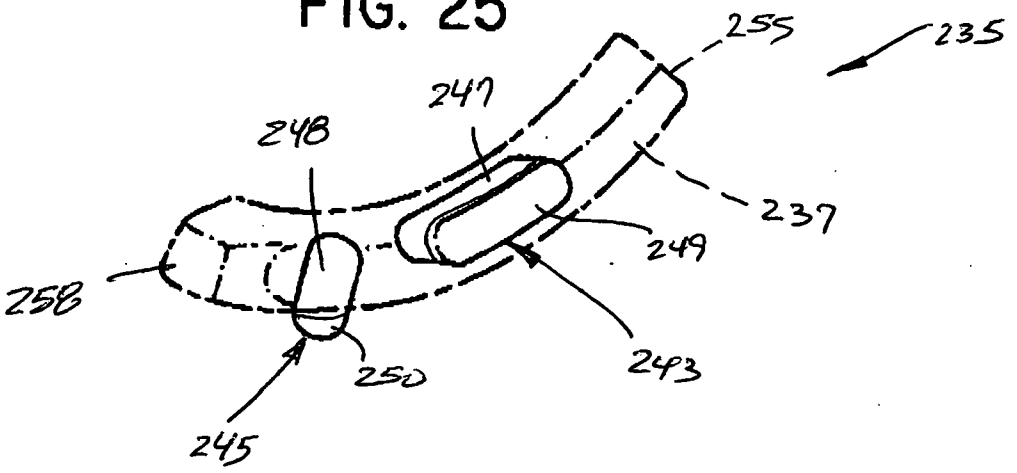

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FIG. 26

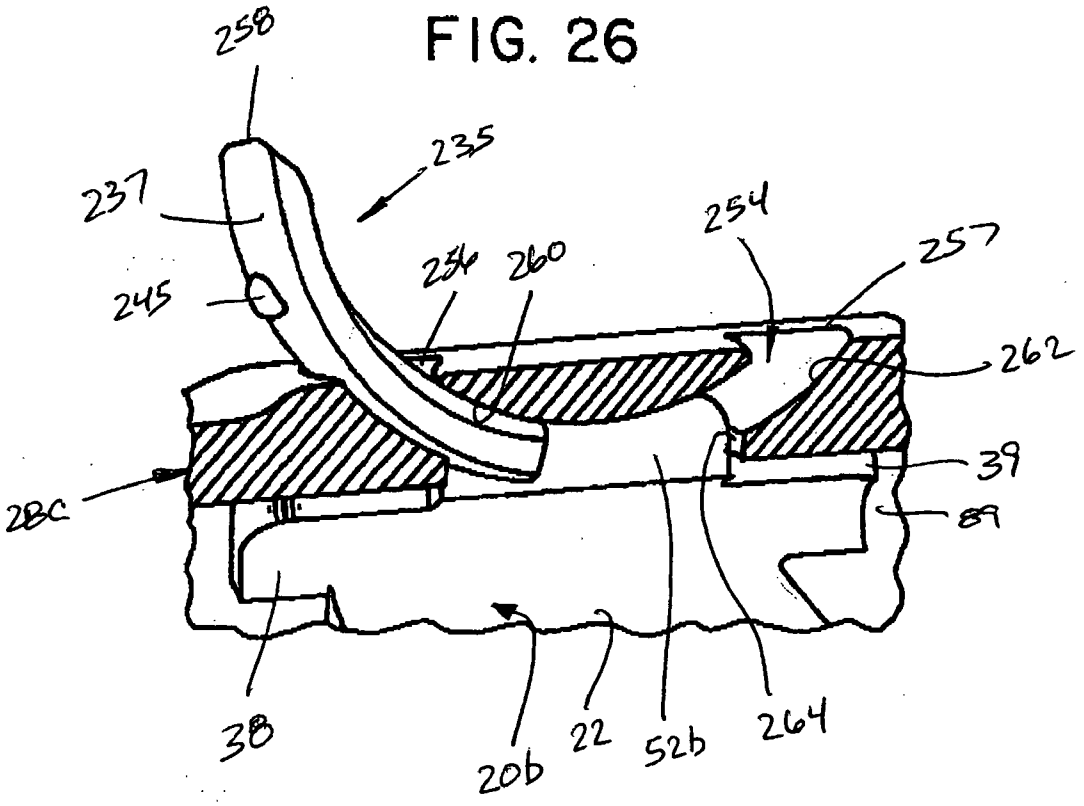

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FIG. 27

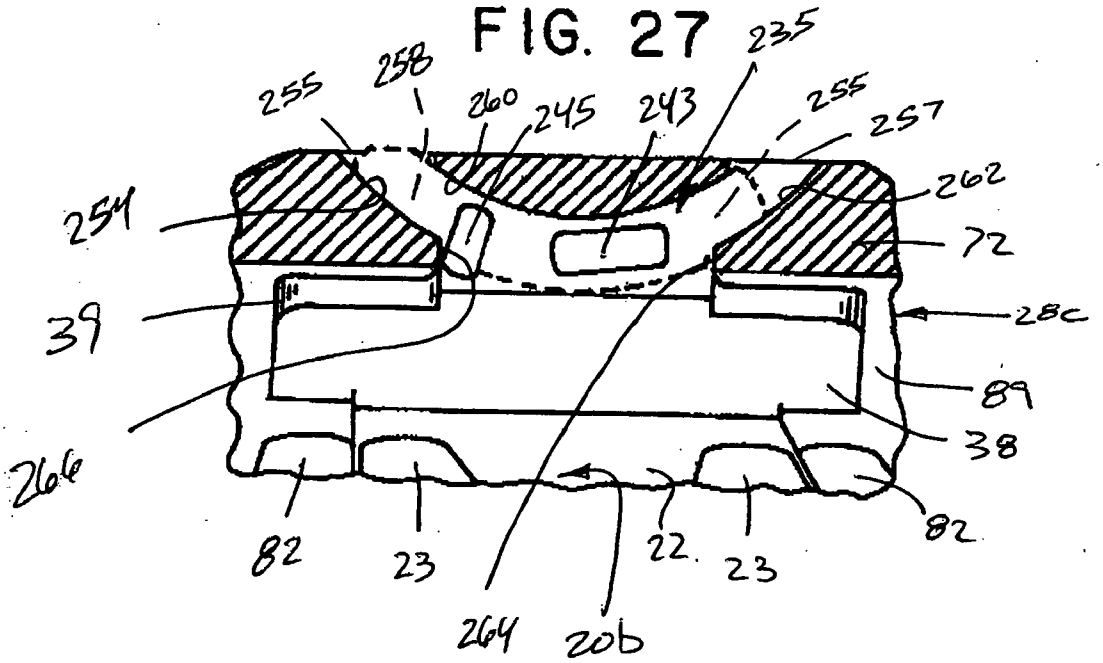
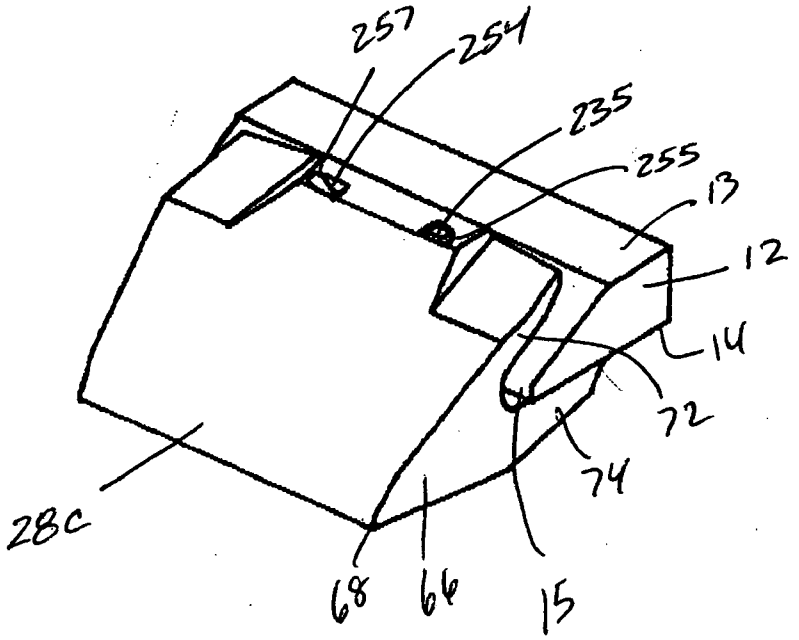

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FIG. 28


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WEAR EDGE ASSEMBLY

FIELD OF THE INVENTION

[0001] The present invention pertains to a wear assembly for protecting a structure subjected to an abrasive environment. In a preferred construction, the inventive wear assembly is particularly suited for protecting the digging edge of an excavator, such as an excavating bucket.

BACKGROUND OF THE INVENTION

[0002] Excavating buckets and other excavating equipment are typically subjected to harsh conditions. A series of wear members are usually provided to protect the digging edge and other portions of the bucket from premature wear. Wear members have in the past been secured to the bucket in many different ways.

[0003] For example, in U.S. Pat. No. 4,570,365 to Bierwith, the wear members are secured to the lip of the bucket through the use of a wedge and spool lock arrangement that is fit through a hole in the lip spaced from the front edge. In this arrangement, the spool pinches the rear ends of the wear member against the inner and outer faces of the lip as the wedge is driven into the hole. However, under Load, the legs of the wear member can shift and cause loosening of the lock and possible loss of the wear member. In addition, the formation of a hole in the tip weakens the lip and lessens its ability to effectively resist large loads as it is forced into the ground.

[0004] In U.S. Pat. No. 4,748,754 to Schwappach, a lateral boss is welded to the inner face of the lip as a support for holding the wear member to the lip. The wear member has a rearwardly extending leg provided with an opening into which the boss is received. A lock composed of a pair of opposed, generally C-shaped securing members joined by a central elastomer is placed in the opening between the boss and the end of the leg. The elastomer expands to fill the opening and provide some tightening of the assembly. However, the elastomer does not possess sufficient strength for the lock to well withstand the expected loads. Hence, the wear member can shift during use, which may result in ejection of the lock and loss of the wear member.

[0005] U.S. Pat. No. 5,088,214 to Jones discloses a wear assembly wherein a longitudinal boss is fixed to the lip for receipt in a corresponding slot defined in the wear member. A hole is formed in the wear member to receive and position a lock against the rear end of the boss to hold the wear member to the tip. The lock is a rigid, block-shaped member that provides firm resistance to the applied loads. White the use of a rigid member instead of an elastomeric body avoids overloading the lock during use, it does not provide any ability to tighten the mounting of the wear member on the lip.

[0006] U.S. Pat. No. 5,653,048 to Jones et at. discloses a lock with a rigid body and a threaded plug to tighten the wear member onto the lip. However, the threaded plug can loosen during use in some circumstances due to vibration and impact forces. Moreover, the lateral latch construction used in both this patent as well as the '214 patent, can at times be difficult to release on account of fines being impacted in the expansion space for the elastomer.

[0007] Accordingly, there is a need for an improved assembly for attaching a wear member to the digging edge of an excavator that avoids the problems of the prior art.

SUMMARY OF THE INVENTION

[0008] The present invention pertains to an improved assembly for securing a wear member to a structure subjected to wear in an abrasive environment. In a preferred construction, the wear member protects the front digging edge of an excavating bucket.

[0009] In one aspect of the invention, the wear assembly includes a lock for securing the wear member in place that is provided with improved means for tightening the fit of the wear member onto the lip and retaining the lock in the assembly during use. With the improved means, the lock is able to effectively tighten the fit of the wear member on the lip, resist loosening of the fit, and facilitate easy removal of the lock without a concomitant increased risk of lock ejection.

[0010] In accordance with one aspect of the invention, the lock has a threaded take-up element that tightens the wear member onto the lip and includes means to inhibit loosening during use. A tighter fit results in reduced wear in the components. In one preferred embodiment, the take-up element includes a threaded member and a resilient member. The resilient member resists loosening of the threaded member and applies an expanding force that continues to tighten the fit of wear member on the protected structure even after wear begins to develop in the components. In addition, the threaded member provides a firm stop that resists overloading and lock ejection. In another construction, a threaded take-up member has an area of deformed threads to prevent inadvertent loosening of the take-up element.

[0011] In accordance with another aspect of the present invention, an arcuate path is used to effectively retain the lock and yet still permit easy release when replacement of the wear member is needed. In one embodiment, a lock body defines an arcuate path for receipt of a resilient latch member. The arcuate path enables the latch to be retracted into an open space free of impacted fines. In another embodiment, the wear member defines an arcuate path for receipt of an arcuate lock. The arcuate path inhibits pin ejection, but still permits easy removal of the lock with a hammer.

[0012] In accordance with another aspect of the invention, the lock utilizes a resilient take-up element and a resilient latch in a construction that provides continued tightening without an increased risk of lock ejection. In one embodiment, an arcuate lock is fit in an arcuate path. The lock includes an elastomeric body as the take-up element to tighten the wear member on the lip. In this way, the elastomeric body can apply a continued tightening force, and the rigid lock body in the arcuate path inhibits pin ejection.

[0013] In accordance with another aspect, a shroud or other wear member adapted to overlie the front digging edge of a bucket lip includes an arcuate passage which opens on both ends in an upper, exterior surface of the wear member for receiving a lock. The elimination of a large opening for receiving the lock increases the strength of the wear member. Moreover, the arcuate passage facilitates easy insertion and removal of the lock with a hammer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] **FIG. 1** is a front perspective view of a wear assembly in accordance with the present invention secured to a Lip of an excavator.

[0015] **FIG. 2** is a side view of the wear assembly secured to the lip.

[0016] **FIG. 3** is a rear perspective view of the wear assembly with the lip in phantom.

[0017] **FIG. 4** is a front perspective, exploded view of the wear assembly on the lip with the lip shown in phantom.

[0018] **FIG. 5** is a rear perspective view of a boss of the wear assembly.

[0019] **FIG. 6** is a rear perspective view of the wear member.

[0020] **FIG. 7** is a rear view, in partial cross section along line VII-VII in **FIG. 6**, of the wear assembly.

[0021] **FIG. 8** is a rear perspective view of a lock of the wear assembly.

[0022] **FIG. 9** is a front perspective view of the lock.

[0023] **FIG. 10** is a partial rear perspective view, in partial cross section, of the wear assembly with the lock being inserted.

[0024] **FIG. 11** is a partial rear perspective view, in partial cross section, of the wear assembly.

[0025] **FIG. 12** is a partial rear view of the wear member of a second embodiment.

[0026] **FIG. 13** is a rear perspective view of a second embodiment of a lock in accordance with the present invention with the lock body shown in phantom.

[0027] **FIG. 14** is a front perspective view of the second embodiment of the lock with the lock body shown in phantom.

[0028] **FIG. 15** is a partial rear perspective view, in partial cross section, of the second embodiment of the lock being inserted into the wear assembly.

[0029] **FIG. 16** is a partial rear perspective view, in partial cross section, of the wear assembly of the second embodiment.

[0030] **FIG. 17** is a partial rear view of a wear member of a third embodiment.

[0031] **FIG. 18** is a rear perspective view of a Lock for the third embodiment with the lock body shown in phantom.

[0032] **FIG. 19** is a front perspective view of the third embodiment of the lock in accordance with the present invention with the lock body shown in phantom.

[0033] **FIG. 20** is a partial rear perspective view, in partial cross section, of the third embodiment of the wear assembly.

[0034] **FIG. 21** is a partial rear perspective view, in partial cross section, of the wear assembly with the third embodiment of the wear assembly.

[0035] **FIG. 22** is a rear perspective view of a fourth embodiment of a wear member.

[0036] **FIG. 23** is a rear view of a wear member, in partial cross section along line XXIII-XXIII in **FIG. 22** of the fourth embodiment.

[0037] **FIG. 24** is a front perspective view of the lock of the fourth embodiment.

[0038] **FIG. 25** is a rear perspective view of the lock of the fourth embodiment with the lock body shown in phantom.

[0039] **FIG. 26** is a partial cross sectional view of the wear assembly of the fourth embodiment lock taken along line XXIII-XXIII in **FIG. 22**, with the lock being inserted into the wear member.

[0040] **FIG. 27** is a partial cross sectional view of the wear member of the fourth embodiment lock taken along line XXIII-XXIII in **FIG. 22**, with the lock inserted into the wear member.

[0041] **FIG. 28** is a front perspective view of the fourth embodiment of the wear assembly secured to the lip.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0042] The present invention pertains to an assembly for securing a wear member to a structure subjected to an abrasive work environment. The inventive wear assembly is particularly suited for protecting an edge of a structure, such as a digging edge of an excavating bucket.

[0043] In a preferred construction, the wear member is a shroud that overlies and protects the front digging edge of an excavating bucket lip **12**. The lip includes an inner face **13**, an outer face **14** and a front edge face **15 (FIGS. 1 and 2)**. While the illustrated lip includes an interior ramp surface **16**, the invention can be used with other kinds of lips. Moreover, the inventive concepts can be used to secure other kinds of wear members to other excavators.

[0044] The invention is at times discussed in terms of relative terms, such as up, down, vertical, horizontal, etc. for the sake of easing the description. These terms are to be considered relative to the orientation of the elements in **FIG. 1** (unless otherwise noted), and are not to be considered limitations on the invention. As can be appreciated, the wear member can be used and oriented in a variety of ways.

[0045] Boss **20** has a body or first leg **22** extending along outer face **14** of lip **12 (FIGS. 2-5)**. While boss **20** is preferably welded to the lip, it could be formed (e.g., cast or forged) as an integral part of the lip or secured by mechanical means. In addition, the boss could each be formed as a multiple of parts, which are integral or spaced apart, although a one-piece member is preferred for simplicity and strength. In the preferred construction, body **22** includes holes **23** to facilitate welding of the boss to the lip. Welding is also preferably provided along selected portions of the periphery of the boss, such as along brace **30** and the inner or second leg **39**.

[0046] Body **22** preferably includes a pair of rails **24** extending along sidewalls **26** in a rearward direction from front edge **15 (FIGS. 4 and 5)**. The rails project laterally outward from each sidewall **26** to form a T-shaped cross-sectional configuration. Rails **24** have holding surfaces **25** that are spaced from and facing outer face **14**. As discussed below, rails **24** cooperate with a wear member or (in this

case) shroud **28** to prevent its movement away from the lip. While a T-shaped configuration is preferred, the rails could have other shapes, such as dovetail. Alternatively, the rails could be formed on the wear member **28** and the slot in boss **20**.

[**0047**] A brace **30** preferably extends laterally across the rear end of body **22** (**FIGS. 2-5**). In the preferred construction, the rear ends of rails **24** are integrally fixed to brace **30** to additionally support the rails when under load (**FIG. 4**). Such support at the rear end of the rails is particularly advantageous in resisting vertical loads that tend to rotate or swing the wear member about the front digging edge of the lip. Brace **30** further extends outward of body **22** to define a stop surface **32** adapted to abut a rear end **33** of shroud **28** and thereby reduce the stress on the boss, which in turn, reduces the stress along front edge **15** of lip **12**.

[**0048**] A front part **38** of boss **20** wraps around front edge **15** of lip **12** to define an inner leg **39** along the ramp surface **16**. Front part **38** is preferably wider than body **22** to provide a larger surface area to contact shroud **28** and lip **12** (**FIG. 5**), but it could have the same or smaller width than the body. Inner surface **40** of boss **20** (i.e., the surface that faces lip **12**) is shaped to conform to the shape of the particular lip to which it is fixed (**FIGS. 2 and 5**). In this case, the inner surface **40** includes a first portion **42** set against front edge **15**, a second portion **44** set against ramp **16**, and a third portion **46** set against outer face **14**. As seen in **FIG. 2**, inner leg **39** preferably overlies only ramp surface **16** so that the boss is outside or below the inner face **13** to avoid impeding the gathering or dumping of the excavated material. However, other arrangements for attaching the boss are possible. For example, if the front of the lip has a curved or other shape, inner surface **40** would be changed to match the shape of the lip.

[**0049**] The front face **48** of boss **20** preferably has a uniform curved shape to provide a smooth surface without corners to act as a bearing face for shroud **28**. In this way, the boss is able to provide a better bearing surface than the front of lip **12** with its relatively sharp and thinner front digging edge. Nevertheless, other shapes for front face **48** are possible. Alternatively, body **22** could be positioned within the bucket so that third portion **46** is fixed to inner face **13** instead of outer face **14**.

[**0050**] In the preferred construction, inner leg **39** includes a support **50**, which projects outward to form an abutment for lock **56** (**FIGS. 4 and 5**). In particular, support **50** includes a rear wall **52** that defines an orthogonal wall to oppose lock **56**. In one preferred construction, rear wall **52** includes a recess **54**, preferably centrally located, to cooperate with a plug member **58** of the lock (**FIGS. 8-10**).

[**0051**] In the preferred construction, shrouds **28** have a front working portion **66** that tapers to a narrowed front edge **68**, and a rear mounting portion **70** that is bifurcated to define an inner leg **72** and an outer leg **74** (**FIGS. 1-4** and **6-7**). Outer leg **74** has a generally flat outer face **76** and a rear deflector face **78** that is inclined forwardly away from lip **12** to direct any earthen material away from the wear member during reverse movement of the bucket. The inner face **80** preferably has a pair of dogleg flanges **82** that face inward to define a T-shaped slot **84** for receiving body **22** and rails **24**. Flanges **82** could have different shapes to define a slot with a dovetail or other configuration to complement the shape of rails **24**. Alternatively, the flanges could be replaced with a thicker outer leg that includes inner walls to form the slot receiving the boss **20**. Also, the tongue and groove arrangement could be reversed so that the boss is formed to define the slot and the wear member a tongue received into the slot (not shown).

[**0052**] Shroud **28** includes an inner surface **85** that includes inner face **80** of outer leg **74**, inner face **87** of inner leg **72**, and an inner corner surface **89** at the intersection of legs **72**, **74** (**FIGS. 6 and 7**). Inner corner surface **89** has a shape that generally matches front face **48** of boss **20** and abuts against it. Accordingly, in the preferred embodiment, inner corner surface **89** has a generally uniform curved surface. When assembled, inner face **80** of outer leg **74** overlies body **22** and outer face **14**, and inner face **87** of inner leg **72** overlies inner leg **39** of boss **20** and ramp surface **16** of lip **12**. Inner leg **72** includes, along inner surface **87**, a cavity **91** sized to receive support **50**.

[**0053**] Inner leg **72** includes an aperture **86** adapted to receive lock **56** therein. In the preferred embodiment, aperture **86** has a main portion **90** having a generally rectangular configuration to match the shape of the preferred lock, though other shapes are possible, and a stem portion **92** that opens in the rear wall **94** of inner leg **72** to provide clearance for plug member **58** (**FIGS. 4 and 6**). The rear wall **88** of aperture **86** forms a bearing surface to each side of stem portion **92** to abut lock **56**.

[**0054**] When shroud **28** is installed, it is slid over lip **12** such that inner and outer legs **72**, **74** straddle the lip (**FIGS. 1-4**). Rails **24** of body **22** are fit within slot **84** as shroud **28** is moved rearward. The rearward movement is continued until inside corner surface **89** abuts front face **48** of boss **20**. At this juncture, rear ends **33** of flanges **82** of outer leg **74** are preferably placed in close proximity to stop surface **32**. With cast parts, it is not practical for inside corner surface **89** and rear ends **33** to simultaneously abut front face **48** and stop surface **32**, respectively. However, by placing rear ends **33** in close proximity with stop surface **32**, the two surfaces will typically abut after a short amount of time as wear develops in the parts to provide extra support for the loads applied to the shroud and provide enhanced protection for the tip.

[**0055**] In the preferred construction, Lock **56** includes a body **101** having a generally parallelepiped configuration that corresponds to the shape of aperture **86** (**FIGS. 8-11**), though other shapes can be used. The body includes a front wall **103**, a rear wall **104**, and sidewalls **105**, **106**. A threaded bore **109** extends through body **101** and opens in front and rear walts **103**, **104**. Plug member **58** includes a threaded shank **111** to be threadedly received into bore **109**, and a tool-engaging formation **113** on rear end **115**. White in the preferred construction formation **113** is formed as a hex-shaped socket, the socket could have other shapes or be replaced with other kinds of flats adapted to cooperate with tools to effect turning of the plug. The front end **117** of plug **58** is adapted to project forward and abut bearing face **119** of boss **20** within recess **54**. In this way, plug member **58** can be advanced so as to push against bearing face **119** of boss **20**, which in turn, presses rear wall **104** of lock **56** against rear wall **88** of aperture **86**. This movement of plug member **58**, then, causes shroud **28** to be pushed tightly against front face **48** of boss **20**. A tighter fit reduces the shifting of the

shroud during use, which will in turn reduce the amount of wearing among the components.

[0056] When shroud **28** is fit onto lip **12**, the front wall **121** of aperture **86** is generally aligned with rear wall **52** of support **50**, though it could also be spaced rearward thereof, to permit lock **56** to fit within aperture **86** and be rearward of support **50**. In this way, front wall **103** opposes rear wall **52** of support **50** and front wall **121** of aperture **86**. Further, the recessed wall **119** in recess **54** sets underneath a midsection **125** of inner leg **72** of shroud **28**, i.e., forward of aperture **86** (**FIGS. 5 and 10**). Accordingly, as plug member **58** is advanced to engage recessed wall **119**, it extends underneath midsection **125**. In this way, plug member **58** not only functions as a take up member to tighten the fit of the shroud against the boss, it also functions as a latch to hold the lock in aperture **86**. Moreover, since the rear end **115** of plug member **58** sets within stem portion **92** (which can be easily cleared) the plug member can be easily retracted to remove the lock without concern over impacted fines blocking the movement.

[0057] In the preferred construction, one sidewall **105** of lock body **101** has an arcuate shape to fit against an arcuate sidewall **127** of aperture **86** so that the lock can be easily swung into aperture **86** (**FIG. 10**). The opposite sidewall **106** preferably includes a laterally projecting tang **129** to ease removal of lock **56** from aperture **86**. Of course, lock body **101** could omit these features or have other shapes.

[0058] In the preferred construction, front wall **103** of lock **56** and front walt **121** of aperture **86** each includes a channel **131**, **133** that are aligned to form a passage **135** extending through inner leg **72** of shroud **28**. The passage is sized to permit insertion of a punch or other slender tool (not shown). The punch is hammered against the threads of plug member **58** adjacent front wall **103** of lock **56** to peen the threads and prevent inadvertent loosening during use of the excavator. Of course, passage **135** could be defined in other ways. Also, the peening does not prevent intentional withdrawal of the plug member through the use of a wrench.

[0059] In use, shroud **28** is slid onto boss **20** with the body **22** fit within slot **84** until inner corner surface **89** abuts front face **48**. The front face of the boss is narrower than the shroud and preferably fits into a recess in the shroud as disclosed in co-pending U.S. patent application Ser. No. 10/425,605, filed Apr. 30, 2003, which is herein incorporated by reference in its entirety. As seen in **FIG. 2**, neither shroud **28**, boss **20** nor lock **56** project into the excavator, i.e., above inner face **13**. Accordingly, the assembly does not hinder the gathering or dumping of the load. Once the shroud is fully pushed onto the lip, aperture **86** is generally positioned just rearward of rear wall **52** of support **50**. With plug member **58** generally flush or rearward of front wall **103**, arcuate sidewall **105** is set against curved sidewall **127** and lock **56** swung downward into aperture **86**. A wrench or other tool is then used to turn plug member **58** to advance the plug member beneath midsection **125** and against recessed wall **119**. Advancement of the plug continues to pull shroud **28** tightly against front face **48**. Once the plug has been fully advanced, a punch is slid into passage **135** and hammered against the threads of plug **58** adjacent front wall **103** of lock **56** to deform an area of the threads and prevent undesired loosening during use.

[0060] Alternatively, a second lock **140** can be used to hold shroud **28***a* to boss **20** (**FIGS. 12-16**). Shroud **28***a* is the same as shroud **28** except where disclosed as being different. Accordingly, the same reference numerals are used for like parts.

[0061] In this arrangement, front wall **121** of aperture **86** preferably includes a depression **143** instead of channel **131** (**FIG. 12**). Otherwise, the construction of the components is the same. Lock **140** has a body **145** preferably having generally a parallelepiped shape with a front wall **147**, a rear wall **148**, and sidewalls **149**, **150** (**FIGS. 13-14**). As with lock **56**, sidewall **149** has a concave, arcuate shape to pivot about sidewall **127**, and a tang **153** to ease removal of the lock.

[0062] Lock **140** further includes a take-up assembly **155** comprising a plug **157** received in a pocket **159** in front wall **147**, and a threaded pusher **161** received in a threaded bore **163** extending inward from rear wall **148**. Bore **163** connects with pocket **159** so that pusher **161** engages plug **157**. Plug **157** includes an elastomeric body **165** preferably composed of rubber or other resilient material, and a shell **167** composed of steel or other hard material preferably bonded to the elastomeric body by molding or adhesive. The elastomeric body **165** fits within a rear portion **173** of pocket **159**, which is slightly Larger than opening **175** in front wall **147**; that is, the elastomeric body is compressed to fit within opening **175** and then expands into rear portion **173** to hold plug **157** within lock body **145**. Rear portion **173**, however, is longer (front to back) to permit axial movement of the elastomeric body. Pusher **161** consists of a threaded shank having a blunt forward end **169** to engage elastomeric body **165**, and a rear end **171** provided with a hex socket or other wrench-engaging formation **172**.

[0063] Pusher **161** and plug **157** are initially retracted to facilitate insertion of Lock **140** into aperture **86**. Sidewall **149** of lock **140** is, then, fit against sidewall **127** and the lock swung into aperture **86** in the same way as Lock **56** (**FIG. 15**). Once lock **140** is in place (**FIG. 16**), a wrench is used to turn pusher **161**, which in turn, abuts the elastomeric body **165** of plug **157**. Advancement of pusher **161** continues so that shell **167** of plug **157** abuts rear wall **52** of support **50** and moves Lock body **145** rearward. This movement of lock body **145** pulls shroud **28***a* tightly against front face **48** of boss **20**. Pusher **161** is then further tightened to compress elastomeric body **165** so that it will continue to apply a pulling force on shroud **28***a* to maintain a tight fit even after wear begins to develop through use. This compression of the resilient plug member **157** also applies pressure on the threaded pusher member **161** to resist loosening of the pusher during use.

[0064] Lock **140** further includes a latch member **177** that is received into a threaded bore **179** in body **145** adjacent bore **163** and pocket **159**. Latch member **177** preferably includes a threaded shank portion **181** threaded into bore **179**, an unthreaded latching portion **183** that projects forward of front wall **147**, and a hex socket **185** or other tool-engaging formation. Nevertheless, Latch **177** could be threaded along its entire length. The latching shank is preferably received in a depression **143** in shroud **28***a* and recess **54** to prevent inadvertent release of lock **140** from aperture **86**. Since the latch does not receive the impact loads applied to the wear member **28***a*, it is less inclined to release during use. Further, since it retracts into stem portion **92** of aperture **86**, impacted fines should not hinder its rearward

movement. Nevertheless, latch member **177** could be altered; e.g., it could be advanced by means other than a threaded shank or it could be received beneath midsection **125** without depression **143** (if made smaller and lower in the lock).

[**0065**] As another alternative, a third lock **190** could be used to secure shroud **28***b* to boss **20***b*. Shroud **28***b* and boss **20***b* are the same as shroud **28** and boss **20** except where differences are noted. Accordingly, the same numbers are used for the same parts.

[**0066**] In addition, lock **190** is the same as lock **140** except for the latch and the omission of the pusher (although the pusher could be included if desired). Instead of latch **177**, lock **190** includes an arcuate latch member **193** comprising an elastomeric body **195** composed of rubber or other suitable elastomer, a steel detent member **197** on one end of body **195**, and a steel retainer member **199** on the other end of body **195**. The components are preferably bonded together by molding or adhesive.

[**0067**] An arcuate passage **201** is formed in body **191** of lock **190** for receiving latch **193** (**FIGS. 18-19**). Passage **201** preferably extends from top wall **203** to sidewall **205** of lock **190**. In this construction, passage **201** opens below tang **207**. Passage **201** further includes a shoulder **209** near top surface **203** to cooperate with retainer member **199**. Retainer **197** extends along the convex side **210** of the rear end **212** of body **195**, and includes a ledge **214** to abut shoulder **209** to retain the latch in the lock.

[**0068**] For use with lock **190**, sidewall **211** of aperture **86** includes a keeper **213** along the outer surface **215** of inner leg **72**. Keeper **213** preferably sets below tang **207** to form an overhang for detent member **197** of latch **193**. In addition, there is no need for recess **54** in support **50**. As a result, rear wall **52***b* preferably extends continuously across support **50** without recess **54**.

[**0069**] In use, lock **190** is swung into aperture **86** in the same manner as locks **56**, **140**. Detent **197** preferably has a generally trapezoidal shape, although other shapes are possible. Specifically, detent **197** has an elongate, curved concave side **216** to match the curvature of the upper side **217** of passage **201**, and a shorter, curved convex side **218** to match the lower side **221** of passage **201**. The free end **223** of detent **197** includes a ramp surface **225** that is inclined outward and upward from sidewall **205** of lock body **191**. In this way, ramp surface **225** functions to retract detent **197** within passage **201** against the bias of body **195** to permit passage of latch **193** past keeper **213** as the lock is swung into aperture **86**. Once the detent passes keeper **213**, the detent will spring back into a latched condition behind the keeper.

[**0070**] To remove the lock for replacement of shroud **28***b*, an operator first disconnects ledge **214** from shoulder **209** and pries latch **193** rearward slightly with a slender tool (e.g., a screwdriver). At this point, the operator grasps and pulls the latch rearward so that detent **197** retracts into lock body **191**. Then, the lock can be rotated out of aperture **86** by lifting tang **207**.

[**0071**] As another alternative, shroud **28**c could be secured to boss **20***b* with a fourth lock **235**. Shroud **28***c* and boss **20***b* are the same as shroud **28** and boss **20** except where differences are noted. The same reference numbers are used for the same parts.

[**0072**] Lock **235** includes a steel, elongate, arcuate body **237** provided with first and second pockets **239**, **241** to receive a take-up element **243** and a detent **245**. The take-up element and detent are each composed of an elastomeric body **247**, **248** and a shell **249**, **250** bonded together preferably by molding or adhesive. Bodies **247**, **248** are preferably secured within pockets **239**, **241** by molding or adhesive, but could be secured by other means. Lock body **237** is curved to be received into a passage **254** defined in shroud **28***c* of a corresponding shape. The leading end **255** of body **237** has a reduced cross section as compared to the trailing portion **258**. A stop **259** is positioned at the inner end of leading end **255**.

[**0073**] Passage **254** has a curved shape that defines two spaced apart openings **256**, **257** in the upper surface of inner leg **72**. Passage **254** extends through midsection **125** and intersects cavity **91**. In the preferred construction, passage **254** includes a first segment **260** to one side of cavity **91** and a second segment **262** to the other side of cavity **91**. First segment **260** has a Larger cross section than second segment **262** to ease installation and removal of the lock. In the preferred construction, passage **254** is tapered across its length.

[**0074**] In use, once shroud **28***c* has been set onto boss **20***b*, lock **235** is inserted into passage **254**. In particular, the leading end **255** is inserted into the first passage segment **260**. Since the first segment of the passage is sized to receive the larger trailing portion **257** of body **237**, the leading end **255** is initially easily fit within the passage. Lock **235** is driven into the passage by a hammer. Lock body **237** is preferably tightly fit within passage **254** to better resist ejection during use. As lock **235** is driven into passage **254**, take-up element **243** and detent **245** are each compressed into body **237** by its contact with the passage walls. Advancement of lock **235** continues until stop **259** abuts the leading edge **264** of second passage segment **262** of reduced cross section. In this position, take-up element **243** and detent **245** are within cavity **91** and naturally expand to their normal projecting positions (as seen in **FIG. 24**). Take up element **243** projects from the front of body **237** to abut rear wall **52***b* of support **50** of boss **20***b* and pull shroud **28***c* against front face **48** of the boss. Detent **245** extends downward into open space adjacent the trailing edge **266** of first passage segment **260** to function as a stop inhibiting inadvertent release of lock **235** from passage **254**. To remove lock **235**, the lock is simply hammered in the reverse direction with the help of a slender toot (not shown) contacting leading end **255**.

[**0075**] Locks **56**, **140**, **190**, **235** could be used to secure other kinds of wear members in place, such as adapters or runners. For example, the inventive lock concepts included in locks **56**, **140**, **190**, **235** could be used to secure such wear members as disclosed in U.S. Pat. Nos. 4,271,615 5,088, 214, 5,241,765, and 5,653,048, incorporated herein by reference.

1. A lock adapted to be received in a wear member for holding a wear member to a structure of an excavator subjected to wear, the lock comprising:

a body adapted to be received in an opening of the wear member, the body including a front wall for opposing a bearing wall of the structure, a rear wall for opposing a bearing wall of the wear member, and a hole extend-

ing through the body and opening in the front and rear walls, the hole having threads;

a threaded member for expanding the lock to tighten the mounting of the wear member on the structure, the threaded member being received in the hole;

a resilient member impeding loosening of the threaded member; and

a retainer releasably holding the body in the opening of the wear member.

2. A lock in accordance with claim 1 in which the resilient member is received in the hole and advanced forward into contact with the structure by the threaded member and compressed between the threaded member and the structure so that the lock applies a continuous biasing force to the wear member.

3. A lock in accordance with claim 2 in which the resilient member further includes an elastomeric body and a hard shell fixed to the elastomeric body to contact the structure and protect the elastomeric body.

4. A lock in accordance with claim 1 in which the resilient member is substantially wider than the threaded member.

5. A lock in accordance with claim 1 wherein the body includes an opening with threads, and wherein the retainer includes a threaded shank received in the opening and adjustable to project from one surface of the body to hold the lock in the wear member and to retract within the one surface of the body to permit removal of the lock.

6. A lock in accordance with claim 5 wherein the hole and the opening are substantially parallel.

7. A lock in accordance with claim 1 wherein the body includes an arcuate passage and the retainer includes a latch that moves in the arcuate passage.

8. A lock in accordance with claim 7 in which the latch includes an elastomeric member and a hard plug fixed to the elastomeric member, wherein the plug is movable to project beyond one surface of the body and to retract within the one surface of the body.

9. A lock in accordance with claim 7, in which the passage includes a shoulder and the latch has a ledge that engages the shoulder to releasably prevent retraction of the latch.

10. A lock adapted to be received in a wear member for holding the wear member to a structure of an excavator subjected to wear, the lock comprising (i) a body having an elongate, arcuate configuration, (ii) a movable take-up element projecting from the body for tightening the connection of the wear member on the structure, and (iii) a latch projecting from the body for retaining the lock in the wear member.

11. A lock in accordance with claim 10 in which the body includes a first end and a second end, wherein the body is wider at the second end than at the first end.

12. A lock in accordance with claim 11 in which the body gradually tapers from the second end to the first end.

13. A lock in accordance with claim 10 wherein the take-up element and the latch are each a resilient member.

14. A lock adapted to be received in a wear member for holding the wear member to a structure of an excavator subjected to wear, the lock comprising:

a body including a front wall for opposing a bearing wall of the structure, a rear walt for opposing a bearing wall of the wear member, and a threaded hole extending through the body and opening in the front and rear walls; and

a threaded member received in the hole and selectively projecting beyond the front wall of the body to expand the lock and thereby tighten the mounting of the wear member on the structure, the threaded member having a thread deformation forward of the front wall to prevent loosening of the threaded member.

15. A wear assembly for protecting a surface of a structure subjected to wear comprising:

a boss fixed to the structure;

a wear member fit with the boss to protect the structure from wear; and

a lock for holding a wear member to a structure subjected to wear, the lock comprising a body adapted to be received in an opening of the wear member, the body including a front wall for opposing a bearing wall of the structure, a rear wall for opposing a bearing wall of the wear member, and a hole extending through the body and opening in the front and rear walls, the hole having threads, a take-up element including a threaded member for expanding the lock to tighten the mounting of the wear member on the structure, the threaded member being received in the hole, means for impeding loosening of the threaded member, and means for retaining the body in the opening of the wear member, which is independent of the impeding means.

16. A wear assembly in accordance with claim 15 in which the threaded member is selectively adjustable to project at varying distances from the front wall of the body to engage the bearing wall of the structure, and to be retracted within the front wall.

17. A wear assembly in accordance with claim 15 in which the take-up element further includes a resilient member that is received in the hole and advanced forward into contact with the structure by the threaded member and compressed between the threaded member and the structure so that the lock applies a continuous biasing force to the wear member.

18. A wear assembly in accordance with claim 15 in which the body includes an arcuate passage and the means for retaining includes a latch that moves in the arcuate passage.

19. A wear assembly in accordance with claim 18 in which the latch includes an elastomeric body and a hard plug fixed to the elastomeric body, wherein the plug is movable to project beyond one surface of the body and be retracted within the one surface.

20. A wear assembly in accordance with claim 19 in which the passage includes a shoulder and the retainer has a ledge portion that engages a shoulder to selectively prevent retraction of the latch.

21. A wear assembly in accordance with claim 16 in which the wear member is a shroud that protects a digging edge of an excavating bucket.

22. A wear member for protecting a surface of an excavator subjected to an abrasive environment, the surface including a boss, the wear member comprising an interior side facing the surface and including a slot to receive the boss, an exterior wear surface, and a lock-receiving passage, the passage having a curved shape with two opposite ends, each end opening in the exterior wear surface.

23. A wear member in accordance with claim 22 in which the passage communicates with a cavity defined along the interior side so that the lock can oppose a bearing face of the boss.

24. A wear member in accordance with claim 23 in which the passage includes a first segment to one side of the cavity and a second segment to the other side of the cavity, wherein the first segment has a larger cross-section than the second segment.

25. A wear member in accordance with claim 22 wherein the passage includes a stop to locate the Lock in a set position.

26. A wear member in accordance with claim 22 wherein a first segment of the passage adjacent one end has a larger cross-section than a second segment of the passage adjacent the other end.

27. A wear member in accordance with claim 22 further including a pair of legs to straddle an edge of a structure having the surface.

28. A wear member in accordance with claim 27 wherein the passage is defined in one of the legs.

29. A wear member in accordance with claim 22 wherein the ends of the passage each opens in the same general direction and in the same wall surface.

30. A wear member in accordance with claim 22 wherein the slot includes grooves for receiving rails on the boss.

31. A wear member in accordance with claim 22 wherein the passage is elongate and narrow.

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