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### SYSTEMS AND METHODS FOR DETERING THEFT OF INTERNAL COMPONENTS OF STREETLIGHTS

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#### Abstract

A streetlight apparatus and method involves use of an anti-theft material for deterring theft of electrical wiring from a streetlight. The anti-theft material includes a stack of rings encircling the electrical wiring in the chamber of the base of the streetlight, where each ring of the stack of rings may include a plurality of ring segments that are each individually insertable through an access opening of the base of the streetlight and positioned around the electrical wiring.

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## Background/Summary

[0001] This application claims the benefit of co-pending U.S. Provisional Application Ser. No. 63/555,249, filed Feb. 19, 2024, which is incorporated herein by reference.

### TECHNICAL FIELD

[0002] The disclosure relates generally to streetlights and more particularly to systems and methods for deterring theft of internal components of streetlights.

### BACKGROUND

[0003] Streetlights typically include a light fixture on top of a tall pole. They are usually installed along streets or walkways. Often there is a long series of streetlights interconnected by electrical wires for powering them. If the wires are made of copper, or some other valuable material, the wires can be susceptible to theft. What would be desirable are systems and methods for deterring theft of internal components such as wires of streetlights and wires between streetlights.

### SUMMARY

[0004] The present disclosure generally pertains to streetlights and more particularly to systems and methods for deterring theft of internal components of streetlights.

[0005] An example streetlight includes a base defining a chamber therein, a removable cover plate attached to the base to cover an access opening that leads to the chamber, a tubular pole extending upward from the base, a light fixture supported by the tubular pole, a conduit leading to the base, an electrical wire extending through the conduit, through the chamber of the base and through at least part of the tubular pole to provide power to the light fixture, and a stack of rings encircling the electrical wire within the chamber of the base, wherein each ring of the stack of rings includes a plurality of ring segments. In some cases, the stack of rings varies in diameter. In some cases, the plurality of ring segments interlock circumferentially. In some cases, the plurality of ring segments are keyed axially.

[0006] An example method includes providing a plurality of ring segments through the access opening and into the chamber of the streetlight, and assembling the plurality of ring segments while in the chamber of the streetlight into a plurality of stacked rings that extend around the electrical wires in the chamber. In some cases, assembling the plurality of ring segments includes assembling a first one of the plurality of ring segments with a second one of the plurality of ring segments to form a first ring that extends around the electrical wires in the chamber, assembling a third one of the plurality of ring segments with a fourth one of the plurality of ring segments to form a second ring that extends around the electrical wires in the chamber, and stacking the first ring and the second ring in the chamber around the electrical wires in the chamber in an axial arrangement. This may be repeated to form a sufficient number of stacked rings that extend around the electrical wires in the chamber to deter theft of the electrical wires from the streetlight.

[0007] An example kit for providing a protective barrier that impedes thieves from stealing electrical wires from a streetlight includes a plurality of ring segments, wherein each of the plurality of ring segments is configured to be: insertable through the access opening and into the chamber of the streetlight; assemblable in the chamber with at least one other of the plurality of ring segments to form a corresponding ring that extends around the electrical wires in the chamber; and stackable to form a plurality of stacked rings that extend around the electrical wires in the chamber.

[0008] The preceding summary is provided to facilitate an understanding of some of the features of the present disclosure and is not intended to be a full description. A full appreciation of the disclosure can be gained by taking the entire specification, claims, drawings and abstract as a whole.

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## Description

### BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The disclosure may be more completely understood in consideration of the following description of various illustrative embodiments of the disclosure in connection with the accompanying drawings in which:

[0010] FIG. 1 is a front view of an example modified streetlight next to an example sponsor;

[0011] FIG. 2 is a front view of an example streetlight before being modified;

[0012] FIG. 3 is a front view similar to FIG. 2 but showing some example wiring and conduit;

[0013] FIG. 4 is a front view of a series of example streetlights;

[0014] FIG. 5 is a cross-sectional front view of a lower section of the streetlight shown in FIG. 1;

[0015] FIG. 6 is a cross-sectional front view similar to FIG. 5 but showing the streetlight after being modified;

[0016] FIG. 7 is a front view of the streetlight being modified;

[0017] FIG. 8 is a perspective view of an example sponsor paying an example entity to help cover the cost of maintaining a streetlight;

[0018] FIG. 9 is a front view of a streetlight being modified;

[0019] FIG. 10 is a cross-sectional view taken along line 10-10 of FIG. 9;

[0020] FIG. 11 is a front view of an example modified streetlight;

[0021] FIG. 12 is a front view similar to FIG. 11 but with a cover plate being removed from the streetlight and an example sensor emitting an alarm signal;

[0022] FIG. 13 is a left side view of an example streetlight being modified;

[0023] FIG. 14 is a left side view similar to FIG. 13 but showing the streetlight after it is modified;

[0024] FIG. 15 is a left side view similar to FIG. 15 but showing the cover plate being removed and the sensor emitting an alarm signal;

[0025] FIG. 16 is a collection of views showing an unmodified conduit of the streetlight, parts for plugging the conduit, and a set of tools for removing the plug;

[0026] FIG. 17 is a cross-sectional view showing a method step for plugging a conduit;

[0027] FIG. 18 is a cross-sectional view showing another method step for plugging a conduit;

[0028] FIG. 19 is a cross-sectional view showing the conduit plugged using the method steps of FIGS. 17 and 18;

[0029] FIG. 20 is a cross-sectional view showing the use of a set of tools for removing the plug from the conduit;

[0030] FIG. 21 is a cross-sectional view showing the set of tools configured for removing the plug from the conduit;

[0031] FIG. 22 is a cross-sectional view similar to FIG. 21 but showing the set of tools being used for removing the plug from the conduit;

[0032] FIG. 23 is a cross-sectional view similar to FIG. 23 but showing the set of tools for removing the plug;

[0033] FIG. 24 is a cross-sectional view similar to FIG. 23 but with the set of tools removed and the plug being manually pulled out farther;

[0034] FIG. 25 is a front view showing an example cover plate being removed from the base of a streetlight;

[0035] FIG. 26 shows a foam-expandable bag being activated by manual manipulation;

[0036] FIG. 27 is a front view showing the foam-expandable bag being inserted into the base of the streetlight;

[0037] FIG. 28 is a front view showing the cover plate being reattached to the base while the foam-expandable bag expands;

[0038] FIG. 29 is a front view showing the foam-expandable bag continuing to expand while the

cover plate is attached to the base; and

[0039] FIG. **30** is a left side view of a streetlight with its base partially filled with a foam-expandable bag;

[0040] FIG. **31** is a perspective view of two example ring segments being assembled;

[0041] FIG. **32** is a perspective view showing the two ring segments assembled to create an example ring;

[0042] FIG. **33** is a front view of an example stack of rings;

[0043] FIG. **34** is a front view showing one method step of assembling and installing the stack of rings with the base of the streetlight;

[0044] FIG. **35** is a front view showing another method step of assembling and installing the stack of rings within the base of the streetlight;

[0045] FIG. **36** is a front view showing another method step of assembling and installing the stack of rings within the base of the streetlight;

[0046] FIG. **37** is a front view showing another method step of assembling and installing the stack of rings within the base of the streetlight;

[0047] FIG. **38** is a front view showing another method step of assembling and installing the stack of rings within the base of the streetlight;

[0048] FIG. **39** is a front view showing another method step of assembling and installing the stack of rings within the base of the streetlight;

[0049] FIG. **40** is a front view showing another method step of assembling and installing the stack of rings within the base of the streetlight;

[0050] FIG. **41** is a front view showing another method step of assembling and installing the stack of rings within the base of the streetlight;

[0051] FIG. **42** is a front view showing another method step of assembling and installing the stack of rings within the base of the streetlight;

[0052] FIG. **43** is a front view showing a cover plate being reattached to the base;

[0053] FIG. **44** is a front view showing the cover plate secured to the base with the internal stack of rings in phantom;

[0054] FIG. **45** is a perspective view similar to FIG. **31** but showing another example of a ring and its ring segments;

[0055] FIG. **46** is a perspective view show two ring segments assembled to create an example ring;

[0056] FIG. **47** is a front exploded view of two example rings similar to the ones shown in FIG. **46**;

[0057] FIG. **48** is a perspective exploded view of an example sheet metal ring and another example ring;

[0058] FIG. **49** is a front view of an example stack of rings with some interposed sheet metal rings;

[0059] FIG. **50** is a front view of another example stack of rings with interposing adhesive layers; and

[0060] FIG. **51** is a front view of another example stack of rings with staggered joints.

[0061] While the disclosure is amendable to various modifications and alternative forms, specifics thereof have been shown by way of example in the drawings and will be described in detail. It should be understood, however, that the intention is not to limit the disclosure to the particular illustrative embodiments described herein. On the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the disclosure.

#### DESCRIPTION

[0062] The following description should be read with reference to the drawings wherein like reference numerals indicate like elements throughout the several views.

[0063] The description and drawings show several examples that are meant to be illustrative of the disclosure.

[0064] FIGS. **1-24** illustrate various apparatuses and methods for thwarting the theft of wires and/or other internal components of streetlights. With respect to FIG. **1**, and in some examples,

streetlight **12** includes a hollow base **20**, a tubular pole **22** extending upward from base **20**, a light fixture **24** on top of pole **22**, a lamp **26** (e.g., incandescent bulb, halogen bulb, LED, etc.) in light fixture **24**, and at least one electrical wire **28** leading to lamp **26**. Examples of wire **28** include one or more insulated “hot” wires, one or more insulated neutral wires, and one or more insulated or non-insulated ground wires. Some examples of base **20** include a cover plate **30** that can be removed for accessing a chamber **32** inside of base **20**. For support, some examples of base **20** are anchored to a concrete foundation **34**. In some examples, some parts of wire **28** extend through a conduit **36**. Some sections of conduit **36** can be buried underground, and other sections can extend up into chamber **32** of base **20**. In some examples, wire **28** includes multiple interconnected wire segments that may vary in length and wire gauge, and the actual wiring configuration can differ from what is shown in the drawings.

[0065] FIGS. **2-5** show streetlight **12** prior to being modified by the present disclosure. FIG. **6** shows one or more plugs **38** (e.g. plugs **38a**, **38b** and **38c**) having been inserted to inhibit the tampering or theft of wire **28** and/or other internal components in pole **22**, base **20** and/or conduit **36**. Some examples of plug **38** include expanded foam (e.g., GREAT STUFF by DuPont or 3M products such as AUTOMIX and 8458 foam), epoxy **40** (FIGS. **16-24**), a mechanical obstruction, and/or various combinations thereof.

[0066] FIG. **7** shows an example means for creating plug **38**. In the illustrated example, cover plate **30** is removed and a pressurized can **42** (or other foam source) and curved wand **44** with a discharge nozzle **46** inject expanding foam **48** into pole **22**, base **20** and/or conduit **36**. When expanded, the foam sets (e.g. solidifies) to create a plug **38**. Plug **38** at least partially surrounds wire **28**. This makes it more difficult for thieves to steal wire **28**.

[0067] FIG. **8** shows an illustrative sponsorship program. In this example, sponsor **10** pays a sponsorship fee **50** to help cover the cost of modifying streetlight **12** and/or covering at least some maintenance cost of one or more streetlights **12**. In some examples, the sponsorship fee **50** includes a plurality of payments (e.g., six bills as shown in FIG. **8**) distributed over a predetermined period **16** (e.g., three years). In some examples, the length of the predetermined period **16** is based on the amount of the sponsorship fee **50**.

[0068] In some examples, an entity **52** receiving the sponsorship fee **50** attaches a notification **14** to streetlight **12**, wherein the notification **14** provides recognition **54** of sponsor **10**. Some examples of recognition **54** include the name of sponsor **10**, a QR code **54a** associated with sponsor **10**, a website address of sponsor **10**, a telephone number of sponsor **10**, a picture of sponsor **10**, etc. Some examples of entity **52** (that receives sponsorship fee **50**) include a municipality, a land property owner, an individual, an organization, etc.

[0069] Arrows **56** and **58** of FIG. **9** and arrows **60** and **62** of FIG. **10** represent examples of attaching notification **14** to streetlight **12**. In some examples, an adaptor **64** with a contoured surface **66** matching the contour of pole **22** or cover plate **30** helps fit a generally flat notification **14** to streetlight **12**.

[0070] FIG. **1** shows a sponsor **10** (e.g., an individual, a group, a family, a Scout troop, an organization, etc.) supporting the maintenance of an example streetlight **12**. A notification **14** (sign, plaque, sticker, label, etc.) provides recognition of sponsor **10**, which has paid to help cover the cost of maintaining or repairing one or more streetlights **12** over a predetermined period of time **16** (e.g. 1 year).

[0071] In some examples, as shown in FIGS. **11-15**, a sensor **68** is added to streetlight **12**. In some cases, sensor **68** provides an alarm signal **70** in response to someone possibly tampering with streetlight **12**. In some examples, alarm signal **70** is transmitted to a remote location **72** (e.g., police department, city street department, sponsor **10**, etc.). The term, “remote” means external to the streetlight **12** and at least 10 feet away. In some examples, alarm signal **70** is transmitted by electromagnetic radiation (e.g., radio signal such as a cellphone signal (3G, 4G, 5G), BLE, WiFi, a mesh network, etc.). In some examples, alarm signal **70** may be transmitted over a wired network.

In some cases, alarm signal **70** may be transmitted over power lines **28** via Power Line Communication (PLC). In some cases, the sensor **68** may be powered by power supplied over wires **28**. In some cases, the sensor **68** may be powered by batteries. In some cases, the sensor **68** may be powered by power received over wires **28** with backup power provided by batteries.

[0072] In some cases, the sensor **68** may cause an audible alarm in response to someone possibly tampering with streetlight **12**. In some cases, the sensor **68** may cause a visual alarm in response to someone possibly tampering with streetlight **12**.

[0073] In some cases, the sensor **68** may cause a visual alarm by temporarily interrupt power to the lamp **26** of the streetlight in a predetermined pattern, causing the lamp **26** to flash on and off at a predetermined period and duty cycle. In some cases, temporarily interrupting power to the lamp **26** in a predetermined pattern produces a detectable signal on the wires **28**, which can be detected by a monitoring station remote from the streetlight **12** and reported to an entity overseeing the maintenance/security of the streetlights **12**. In some cases, neighboring streetlights may detect the detectable signal on the wires **28** and in response temporarily interrupt power to their lamps in a predetermined pattern, causing the neighboring streetlights to also flash on and off. These are just examples.

[0074] In some cases, the sensor **68** may include a deployable payload that can be deployed by the sensor **68** in response to detecting someone tampering with the streetlight **12**. For example, the sensor **68** may deploy a payload of expandable foam to form a plug about the wires **28** in response to detecting someone tampering with the streetlight **12**. In another example, the sensor may deploy an exploding ink tag that when deployed disperses a permanent ink that covers the thief, wires **28** and/or other internal components that the police, security personnel and/or wire salvage yards will recognize as associated with theft. It is contemplated that the deployment of the payload by the sensor **68** may be disabled by an authorized maintenance worker, such as by providing a valid security code to the sensor **68** (e.g. via a Bluetooth connected cell phone, a keypad, and/or in any other suitable manner).

[0075] Some examples of sensor **68** include a light sensor that detects sunlight or a flashlight when cover plate **30** is removed (arrow **72** of FIG. **12**), a limit switch with a spring-loaded button **74** (FIG. **15**) that detects the removal of cover plate **30**, a Hall Effect or motion sensor (e.g. accelerometer, gyroscope) that detects the removal of cover plate **30** and/or hammering on the streetlight, and a microphone responsive to a sound characteristic of hammering or breaking. These are just examples.

[0076] FIGS. **13-15** show one example method of installing sensor **68** and filling base **20** with plug **38** in the form of expanding foam. In this example, a non-hardening putty, screws or magnets hold sensor **68** up against a backside of cover plate **30**. In this example, wand **44** is inserted through a small hole in cover plate **30** to inject expanding foam **48** into chamber **32** while cover plate **30** remains attached to base **20**, as shown in FIG. **13**. FIG. **14** shows the foam having set (e.g. solidified) to form plug **38b**. Plug **38b** fills most of chamber **32** and partially surrounds and bonds to sensor **68**. If cover plate **30** is then later removed and pulled away from sensor **68**, as shown in FIG. **15**, sensor **68** detects outdoor ambient light or spring loaded button **74** extends in response to the separation of cover plate **30** from sensor **68**. In either case, sensor **68** emits alarm signal **70** in response to cover plate **30** being removed.

[0077] In another example, the foam is not injected by wand **44** as shown in FIG. **13**. Instead, the sensor **68** includes a payload of an anti-theft material such as an expandable foam or a permanent ink in an unsolidified state. In response to the sensor **68** detecting a condition that corresponds to someone tampering with the streetlight **12**, the sensor **68** then causes the dispersing of the anti-theft material in at least part of the interior space of the base, the interior space of the tubular pole and/or the interior space of the conduit. Once the anti-theft material solidifies, the anti-theft material provides a deterrent to stealing one or more internal components of the streetlight.

[0078] The condition that corresponds to someone tampering with the streetlight may include, for

example: removal of the cover plate that is removably attached to the streetlight to access the interior space of the base, the interior space of the tubular pole and/or the interior space of the conduit; a predetermined motion profile of at least part of the streetlight, such as a motion profile that indicates someone is hammering on the streetlight; a predetermined electrical profile of electrical signals on one or more of the plurality of wires, such as power no longer being delivered to the streetlight; a predetermined temperature change profile of at least part of the streetlight, such as a temperature change inside of the streetlight caused by the removal of the cover plate; a predetermined sound profile, such as a sound profile that corresponds to hammering and/or drilling on the streetlight; and a predetermined light profile, such as a change in ambient light inside of the streetlight caused by the removal of the cover plate. These are just examples.

[0079] In some examples, cover plate **30** is made mostly of plastic or some other material that is different than the metal of base **20**. Plastic provides several benefits over a cover plate made of cast iron. One, plastic can be 3D printed or cast in acrylic using an inexpensive silicon mold made from the original cast iron cover plate **30**. Two, plastic is weaker than iron, so if a vandal hammers on cover plate **30**, the plastic material will likely breakaway before the more expensive iron base **20** can break. Three, a 3D printed or cast acrylic cover plate **30** can include an integral flat boss **74** for readily attaching notification **14**. Four, a cover plate **30** if cast in clear acrylic would provide a window into chamber **32** to show the wires **28** inside are tamperproof, plus curious others might find it interesting just to see what's inside base **20**.

[0080] FIGS. **16-24** show example structures and methods associated with plug **38c**. Plug **38c** is used for affixing one or more wires **28** within conduit **36** in the area where an upper end **76** of conduit **36** extends into chamber **32** of base **20**. FIG. **16** shows plug **38c** including a set of parts **78**. The set of parts **78** include a foam disk **80** with slits **82** through which wires **28** can pass, an odd bolt **84** (e.g., left handed threads, non-standard thread pitch, etc.), and a supply of epoxy **40**. FIG. **16** also shows a set of plug removal tools **86**. In this example, tools **86** include a standoff **88** and a nut **90** matching bolt **84**.

[0081] One example method of using plug **38c** involves creating an obstruction **92** on wire **28** to inhibit wire **28** from being pulled through plug **38c**. Some examples of obstruction **92** include a knot **94** in wire **28**, a knot **94** tying two wires **28** together, and/or a fastener **96** (e.g., a wire tie, a cable tie, a zip tie, etc.) on one or more wires **28**.

[0082] FIG. **17** shows inserting disk **80** and bolt **84** down into the upper end **76** of conduit **36** such that wire **28** extends through slits **82**. In some examples, the head of bolt **84** can be glued to disk **80**.

[0083] FIG. **18** shows epoxy **40** being poured into conduit **36** to encapsulate wires **28** and the lower end of bolt **84** and to bond to an inner wall **98** of conduit **36**. Disk **80** compressively seals radially against the inner wall **98** of conduit **36** to help prevent liquid epoxy **40** from draining too far down conduit **36**.

[0084] FIG. **19** shows the epoxy **40** having hardened to create plug **38c**. Plug **38c** bonds bolt **84** to conduit **36** with sufficient strength to prevent wire **28** (with its limited tensile strength) from being able to pull plug **38c** out from within conduit **36**.

[0085] FIG. **20** shows an example method of removing plug **38c**. In this example, standoff **88** is placed on the upper end **76** of conduit **36**. Bolt **84** extends through a hole **100** in standoff **88**, and nut **90** screws onto bolt **84**. FIG. **21** shows standoff **88**, bolt **84**, and nut **90** configured to create a threaded plug puller **102** for removing plug **38c**.

[0086] Bolt **84** and nut **90** being unconventional helps prevent a thief from readily using this method of removal. Standoff **88** and special nut **90** are, of course, made available to the entity overseeing the maintenance of the streetlights **12**.

[0087] FIG. **22** shows nut **90** being turned to draw bolt **84** and plug **38c** out from within conduit **36**. Once plug **38c** breaks loose of conduit **36**, as shown in FIG. **23**, bolt **84** and plug **38c** can be manually pulled out completely without standoff **88** and nut **84**, as shown in FIG. **24**.

[0088] In a similar example, plug **38c** is made mostly of metal instead of epoxy. Rather than using an adhesive bond between an epoxy version of plug **38c**, a metal version of plug **38c** can rely on a press-fit and/or include external threads or barbs that grip the inner wall **98** of conduit **36**.

[0089] FIGS. **25-30** show another example structure and method for deterring theft of internal components (e.g., wires **28**) of streetlight **12**. In this example, a foam-expandable bag **104** is inserted in the base **20** of the streetlight **12**. The bag **104** expands to fill much of the open space within base **20**, thereby blocking access to the wires **28** and other internal components.

[0090] In some examples, as shown in FIG. **30**, the bag **104** primarily fills just the space between the wires **28** and the cover plate **30**, so if a thief removes the cover plate **30**, it will appear that the base's entire chamber **32** is filled with foam when actually the base **20** is only partially full. A partially filled base **20** can deter thieves yet allows authorized personnel to remove the bag **104** with some effort to service the streetlight **12** as needed. When the foam is contained in the bag **104** once expanded, the foam may not encapsulate the wires and/or other internal components of the streetlight **12**, and thus can reduce the effort needed by service personnel to remove the foam to service the streetlight **12**.

[0091] FIG. **25** shows, in some examples, the process of at least partially filling the base **20** with foam begins by removing the cover plate **30** from the base **20**. With the cover plate **30** removed, the foam-expandable bag **104** can be inserted into the base **20**.

[0092] FIG. **26** shows an example foam-expandable bag **104**. Some examples of foam-expandable bag **104** are provided by the Sealed Air Corporation of Charlotte, North Carolina. Some examples of the foam-expandable bag **104** are described in U.S. Pat. Nos. 5,899,325 and 6,712,201, both of which are incorporated herein by reference. Some examples of the foam-expandable bag **104** are known by various names such as, Instapak, Quick RT, Sealed Air Instapak Quick Room Temperature Foam Packaging, foam-in-bag systems, and variations and combinations thereof. These are just examples.

[0093] In the illustrated example, foam-expandable bag **104** includes an internal pouch **106** with two chambers **108** and **110**. Chambers **108** and **110** are divided and hermetically sealed by a frangible seal between the two chambers **108** and **110**. In some examples, chamber **108** contains a part-A component (e.g., isocyanate), and chamber **110** contains a part-B component (e.g., polyol).

[0094] The foam-expandable bag **104** can be activated by manual manipulation. Arrows **114** represent manually manipulating (e.g., pressing, patting, kneading, etc.) the foam-expandable bag **104** to break the frangible seal between the two chambers **108** and **110**, thereby allowing the part-A and part-B components to intermix. The resulting mixture of part-A and part-B chemically reacts and expands as foam (e.g., polyurethane foam) that can spread throughout the bag **104**.

[0095] Before fully expanding, however, the foam-expandable bag **104** is quickly inserted in the base **20** (represented by arrow **116** of FIG. **27**), and the cover plate **30** is held in place on the base **20** (represented by arrow **118** of FIG. **28**). Arrows **120** of FIG. **29** represents the bag **104** continuing to expand within the base **20** while the cover plate **30** held in place.

[0096] After fully expanding, the foam in the bag **104** will set to at least a partially hardened state. The expanded, hardened foam makes it difficult to readily access the wires **28** and other internal components of the streetlight **12**. With appreciable effort, however, the expanded bag **104** can be forcefully removed by service personnel to service the streetlight **12** if necessary.

[0097] FIGS. **31-51** show another example structure and method for deterring theft of internal components (e.g., wires **28**) of the streetlight **12**. In this example, a stack of rings **122** (i.e., a plurality of rings **122a-i** in an axially stacked arrangement) are inserted in the base **20** of the streetlight **12**. The stack of rings **122** may be of any number of rings **122** to fit the size of the base **20**. When installed, the stack or rings **122** encircles the wires **28** within the base **20**. The stack of rings **122** are made of a tough material to provide a protective barrier that inhibits thieves from easily stealing the wires **28**. While the rings **122** are shown as defining a round outer perimeter shape, it is contemplated that the outer perimeter shape of the rings **122** may be square, rectangular,



octagonal, hexagonal or any other suitable shape. Likewise, while the rings **122** are shown as defining a round inner perimeter shape, it is contemplated that the inner perimeter shape of the rings **122** may be square, rectangular, octagonal, hexagonal or any other suitable shape.

[0098] The stack of rings **122** is an assembly of rings that can be installed individually within the base **20**. In some examples, each ring **122** comprises two or more ring segments **124**, which can readily fit through the base's access opening **126**, while a full ring **122** might be too large to pass through the access opening **126**. The ring segments **124** also allow each ring **122** to be assembled around the wires **28** without having to first disconnect any of the wires **28**. In some examples, the ring segments **124** include an interlocking shape **128**, so the ring segments **124** can be securely interconnected circumferentially.

[0099] In some examples, the ring segments **124** are made of a durable plastic. Some example ring segment materials include polyurethane and polycarbonate. Other example ring segment materials include rubber, neoprene, UHMW (ultra high molecular weight polyethylene), wood, metal, cement, concrete, stone, fiberglass, etc. In some examples, the ring segments **124** include a metal reinforcement embedded within the ring segment **124** or attached to its surface. In some cases, a metal ring (formed from one or more metal ring segments) may be interposed between two polymer rings. In some cases, a metal ring may be provided between every “nth” polymer ring, wherein N is an integer greater than zero. The rings and ring segments may be secured together using an adhesive, heat welding, or in any other suitable way.

[0100] FIGS. **34-44** illustrate an example installation sequence. FIG. **34** shows a first set of ring segments **124** being installed around the wires **28** and assembled to create an uppermost ring **122a** of FIG. **33**.

[0101] FIG. **35** shows a second set of ring segments **124** being installed and assembled to create the next ring **122b**. This second ring **122b** is placed underneath the first ring **122a**, so the ring **122b** will end up being the second ring from the top of the completed stack of rings **122**.

[0102] FIG. **36** shows a third set of ring segments **124** being installed and assembled to create the next ring **122c**. This third ring **122c** is placed underneath the second ring **122b**, so the ring **122c** will end up being the third ring from the top of the completed stack of rings **122**.

[0103] FIG. **37** shows a fourth set of ring segments **124** being installed and assembled to create the next ring **122d**. This fourth ring **122d** is placed underneath the third ring **122c**, so the ring **122d** will end up being the fourth ring from the top of the completed stack of rings **122**.

[0104] FIG. **38** shows a fifth set of ring segments **124** being installed and assembled to create the next ring **122e**. This fifth ring **122e** is placed underneath the fourth ring **122d**, so the ring **122e** will end up being the fifth ring from the top of the completed stack of rings **122**.

[0105] FIG. **39** shows a sixth set of ring segments **124** being installed and assembled to create the next ring **122f**. This sixth ring **122f** is placed underneath the fifth ring **122e**, so the ring **122f** will end up being the sixth ring from the top of the completed stack of rings **122**.

[0106] FIG. **40** shows a seventh set of ring segments **124** being installed and assembled to create the next ring **122g**. This seventh ring **122g** is placed underneath the sixth ring **122f**, so the ring **122g** will end up being the seventh ring from the top of the completed stack of rings **122**.

[0107] FIG. **41** shows an eighth set of ring segments **124** being installed and assembled to create the next ring **122h**. This eighth ring **122h** is placed underneath the seventh ring **122g**, so the ring **122h** will end up being the seventh ring from the top of the completed stack of rings **122**.

[0108] FIG. **42** shows a ninth set of ring segments **124** being installed and assembled to create the next ring **122i**. This ninth ring **122i** is placed underneath the eighth ring **122h**, so the ring **122i** will end up being the bottom ring of the completed stack of rings **122**.

[0109] FIG. **43** shows the stack of rings **122** completely assembled and installed within the base **20**. Arrows **130** represent the cover plate **30** being reattached to cover the access opening **126**. FIG. **44** shows cover plate **30** secured to the base **20**, with the internal stack of rings **122** shown in phantom.

[0110] In some examples, the rings of the stack of rings **122** vary in diameter to fit the inner

contour of the base **20**, sometimes filling or substantially filing the base's inner chamber **32**. For instance, in the illustrated example, the uppermost ring **122a** has a diameter **132** that is smaller than a diameter **134** of the bottom most ring **122i**. In some examples, an authorized service vehicle carries a kit or an assortment of rings **122** of different diameters to custom build a stack of rings **122** that will fit streetlight bases of various shapes and sizes.

[0111] In some examples, as shown in FIGS. **45-47**, the plurality of ring segments **124** are keyed axially. This ensures the stack of rings **122** are arranged in a desired rotational relationship. It also ensures that the stack of rings **122** rotate as a unit to prevent a thief from rotating individual rings **122** to a more favorable position for removal. In the illustrated example, pegs **136** and mating holes **138** provide an example means for axially keying the plurality of ring segments **124**.

[0112] In some examples, as shown in FIGS. **48** and **49**, the stack of rings **122** includes a plurality of sheet metal discs **140** in an alternating stacked arrangement with a plurality of non-metallic rings. The sheet metal discs **140** make it more difficult for a thief to cut through the stack of rings **122** when the rings **122** are made from a polymer or the like. In some examples, the sheet metal discs **140** have a slit **142**, so the metal discs **140** can be resiliently deformed and installed around the wires **28**.

[0113] In some examples, as shown in FIG. **50**, the stack of rings **122** include a plurality of adhesive layers **144** that securely bond the stack of rings **122** together. In some examples, an adhesive layer **144** may be between each of the rings in the stack of rings **122**. When the stack of rings **122** includes sheet metal discs **140** in an alternating stacked arrangement with a plurality of non-metallic rings, an adhesive layer **144** may be between each of the rings and interposing metal discs in the stack of rings **122**.

[0114] In some examples, the joints **146** between the assembled ring segments **124** can be aligned, as shown in FIG. **50**. Such an arrangement can provide a neater appearance and make the stack of rings **122** easier to assemble. In other examples, the joints **146** are staggered, such as shown in FIG. **51**. A staggered arrangement can provide the stack of rings **122** with greater durability.

[0115] A kit may be provided to retrofit an existing streetlight with a protective barrier that impedes thieves from stealing electrical wires from a streetlight. The kit may include a plurality of ring segments, wherein each of the plurality of ring segments is configured to be: insertable through the access opening and into the chamber of the streetlight; assemblable in the chamber with at least one other of the plurality of ring segments to form a corresponding ring that extends around the electrical wires in the chamber; and stackable to form a plurality of stacked rings that extend around the electrical wires in the chamber. In some cases, each of the plurality of ring segments of the kit is configured to be interlocked circumferentially with the at least one other one of the plurality of ring segments to form the corresponding ring. In some cases, each of the plurality of ring segments of the kit is configured to be keyed axially with at least one other one of the plurality of ring segments when stacked to form the plurality of stacked rings in the chamber. In some cases, the plurality of ring segments of the kit includes ring segments of different sizes. In some cases, the kit may include a plurality of metal discs that are configured to be insertable through the access opening and into the chamber to be interposed between at least some of the plurality of stacked rings in the chamber. In some cases, the kit may include an adhesive to be interposed between at least some of the plurality of stacked rings. In some cases, the kit includes only some or all of these features.

[0116] The disclosure should not be considered limited to the particular examples described above. Various modifications, equivalent processes, as well as numerous structures to which the disclosure can be applicable will be readily apparent to those of skill in the art upon review of the instant specification.

## Claims

- 1.** A streetlight comprising: a base defining a chamber therein; a removable cover plate attached to the base to cover an access opening that leads to the chamber; a tubular pole extending upward from the base; a light fixture supported by the tubular pole; a conduit leading to the base; an electrical wire extending through the conduit, through the chamber of the base and through at least part of the tubular pole to provide power to the light fixture; and a stack of rings encircling the electrical wire within the chamber of the base, wherein each ring of the stack of rings includes a plurality of ring segments.
- 2.** The streetlight of claim 1, wherein the stack of rings varies in diameter.
- 3.** The streetlight of claim 1, wherein the plurality of ring segments interlock circumferentially.
- 4.** The streetlight of claim 1, wherein the plurality of ring segments are keyed axially.
- 5.** The streetlight of claim 1, further comprising a plurality of adhesive layers bonding the stack of rings together.
- 6.** The streetlight of claim 1, wherein the stack of rings includes a plurality of metal discs.
- 7.** The streetlight of claim 1, wherein each ring segment is sized to fit through the access opening while each ring is too large to fit through the access opening.
- 8.** The streetlight of claim 1, wherein the stack of rings includes an upper most ring and a lower most ring, and the upper most ring has an outer dimension that is smaller than that of the lower most ring.
- 9.** The streetlight of claim 1, wherein at least some of the plurality of ring segments are made of a plastic.
- 10.** A method for providing a protective barrier that impedes thieves from stealing electrical wires from a streetlight, wherein the streetlight includes a base defining a chamber, a removable cover plate attached to the base to cover an access opening that leads to the chamber, and a light fixture, wherein the electrical wires extend through the chamber of the base and to the light fixture to provide power to the light fixture, the method comprising: providing a plurality of ring segments through the access opening and into the chamber of the streetlight; and assembling the plurality of ring segments while in the chamber into a plurality of stacked rings that extend around the electrical wires in the chamber.
- 11.** The method of claim 10, wherein assembling the plurality of ring segments comprises: assembling a first one of the plurality of ring segments with a second one of the plurality of ring segments to form a first ring that extends around the electrical wires in the chamber; assembling a third one of the plurality of ring segments with a fourth one of the plurality of ring segments to form a second ring that extends around the electrical wires in the chamber; and stacking the first ring and the second ring in the chamber around the electrical wires in the chamber in an axial arrangement.
- 12.** The method of claim 11, comprising securing the first ring to the second ring in the axial arrangement.
- 13.** The method of claim 11, comprising interpose a metal disc between the first ring and the second ring.
- 14.** The method of claim 10, wherein assembling the plurality of ring segments comprises stacking the plurality of ring segments to form the plurality of stacked rings that extend around the electrical wires in the chamber.
- 15.** A kit for providing a protective barrier that impedes thieves from stealing electrical wires from a streetlight, wherein the streetlight includes a base defining a chamber, a removable cover plate attached to the base to cover an access opening that leads to the chamber, and a light fixture, wherein the electrical wires extend through the chamber of the base and to the light fixture to provide power to the light fixture, the kit comprising: a plurality of ring segments, wherein each of the plurality of ring segments is configured to be: insertable through the access opening and into the chamber of the streetlight; assemblable in the chamber with at least one other of the plurality of

ring segments to form a corresponding ring that extends around the electrical wires in the chamber; and stackable to form a plurality of stacked rings that extend around the electrical wires in the chamber.

**16.** The kit of claim 15, wherein each of the plurality of ring segments is configured to be interlocked circumferentially with the at least one other one of the plurality of ring segments to form the corresponding ring.

**17.** The kit of claim 15, wherein each of the plurality of ring segments is configured to be keyed axially with at least one other one of the plurality of ring segments when stacked to form the plurality of stacked rings in the chamber.

**18.** The kit of claim 15, wherein the plurality of ring segments includes ring segments of different sizes.

**19.** The kit of claim 15, further comprising a plurality of metal discs that are configured to be insertable through the access opening and into the chamber to be interposed between at least some of the plurality of stacked rings in the chamber.

**20.** The kit of claim 15, further comprising an adhesive to be interposed between at least some of the plurality of stacked rings.

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