

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO	
RAD: 13-284264- -5	FECHA: 2015-05-19 18:25:35
DEP: 2020 DIRECCION DE NUEVAS CREACIONES	EVE: 1 REGISTRO/DEPOSITO/CONCESION/DEPOSITO
TRA: 3 PATENTES DE MODELO DE UTILIDAD	FOLIOS: 5
ACT: 430 REQUERSOLICITA	

DIRECCIÓN DE NUEVAS CREACIONES

2020
Bogotá, D.C.,

Abogado(a)/Señor(a)
SANTIAGO HINCAPIE RESTREPO

Asunto: Radicación: 13-284264- -5
Trámite: 3
Evento: 1
Actuación: 430
Oficio: 5459
Folios: 5

Patente de Invención				Patente de Modelo de Utilidad	X
Vía Nacional	X				
Vía PCT (Fase Nacional)		Capítulo I		Capítulo II	
No. Solicitud Internacional					
Fecha de Presentación Internacional					

Como resultado del Examen de Fondo realizado, con fundamento en el artículo 85 y en concordancia con el artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica:

1. Documentos estudiados

Descripción:	Rad. N° 13-284264-00000-0000	04/Diciembre/2013
	Rad. N° 13-284264-00002-0000	14/Enero/2014
Reivindicaciones:	Rad. N° 13-284264-00000-0000	04/Diciembre/2013
	Rad. N° 13-284264-00002-0000	14/Enero/2014
Dibujos:	Rad. N° 13-284264-00000-0000	04/Diciembre/2013
	Rad. N° 13-284264-00002-0000	14/Enero/2014

2. Objeto de la invención

En el presente documento se aplicará lo establecido en la Circular Única en su Título X, con respecto a que cuando la solicitud contenga más de diez (10) reivindicaciones y no se haya pagado la tasa complementaria, sólo se estudiarán las cubiertas por la tasa pagada al momento de realizar el examen de patentabilidad consagrado en el artículo 45 de la Decisión 486.

Título de la solicitud: “Varilla aluminweld puesta a tierra parra descarga eléctrica” (Fl. 1).

El problema planteado en esta solicitud, consiste en lograr una varilla para puesta a tierra que sea de rápida producción, que su capa externa perdure con el tiempo y que evite la formación de par galvánico.

Para resolver este problema técnico la solicitud en estudio propone una varilla para puesta a tierra que comprende una varilla que lleva en la punta una copa y está recubierta por una capa de aluminio.

El objeto de la presente Solicitud se relaciona con la Clasificación Internacional de Patentes (CIP): H 01 R 13/648.

3. De la Solicitud de Patente

Titulo

El título no debe contener términos que hagan referencia a marcas o nombres arbitrarios que el solicitante haya podido asignar a su creación. Se sugiere al solicitante eliminar el término “Aluminweld” del título.

Reivindicaciones (Art 30 D 486, Art 22 PCT)

El capítulo reivindicatorio no es claro porque:

- 1- Los materiales no pueden ser objeto de protección vía modelo de utilidad. En este tipo de patente, solo se protegen las características constructivas del producto para el cual se solicita protección. Por ende, utilizar expresiones que hacen referencia a materiales o a sus propiedades, como: “...*porque el acero se ha recubierto con aluminio...*” no pueden ser incluidas dentro de la reivindicación independiente 1 como una característica esencial de la invención. Cabe agregar que se pueden incluir como características particulares en reivindicaciones dependientes, pero no afectan el examen de patentabilidad.

De igual forma, los métodos, procesos o procedimientos tampoco son patentables, por lo cual expresiones como “...*por varios métodos, enchaquetado y depositado...*” no se deben incluir en el capítulo reivindicatorio, debido a que no contienen materia reclamable.

- 2- En el preámbulo de cada una de las reivindicaciones también se incluye el término “Aluminweld”. Se sugiere al solicitante eliminar dicho término.

En cuanto al preámbulo, se aclara que su función efectivamente es situar la invención en su respectivo campo técnico y, generalmente, coincide con el título de la solicitud. Por lo tanto, en este caso particular, es la parte de la reivindicación que precede la expresión “caracterizada porque”. Es decir: “*La VARILLA ALUMINWELD PUESTA A TIERRA PARA DESCARGA ELÉCTRICA de acuerdo con la reivindicación 1...*”. Cabe aclarar, que las reivindicaciones están bien conformadas, siguiendo la estructura: Preámbulo – Caracterizado por – Parte característica.

- 3- Las expresiones “...y protege la varilla (1)...” (reivindicación 1), “...cuya función es proteger la chaqueta o el depositado (2) y para evitar que (2) rasque o deteriore cuando se está instalando” (reivindicación 2), “...aportando una unión más sólida entre la varilla (1) y la descarga a tierra (5), además evitando la formación de par galvánico.” (reivindicación 3); describen funciones, efectos, ventajas o resultados a alcanzar, los cuales no son aspectos susceptibles de patente. Para mayor claridad, el producto reclamado se debe definir técnicamente mediante sus características estructurales. Se sugiere al solicitante eliminar las expresiones citadas.

Descripción (Art 28 D 486)

La descripción y el resumen también contienen el término “Aluminweld” (Pág. 3, 4, 14), se sugiere al solicitante eliminarlo.

4. Determinación del Estado de la Técnica

El estado de la técnica se determinó con base en la fecha de presentación de la solicitud de patente nacional: diciembre 4 de 2013, y se encontraron los siguientes documentos que anticipan el objeto de esta solicitud:

Ítem	Documento	Título	Fecha de Publicación
D1	US 3'716.649	'Grounding rod and coupler therefor'	13/Febrero/1973
D2	US 1'980.020	'Ground rod'	06/Noviembre/1934
D3	US 3'876.819	'Grounding rod'	08/Abril/1975

El documento D1 ¹ divulga una varilla par puesta a tierra que comprende un tubo de pared delgada de un material resistente a la corrosión, un tubo conductor de aluminio o de otro material conductor para proveer una baja resistencia a tierra y un núcleo de plástico en el tubo interior (resumen).

El documento D2 ² divulga una varilla para puesta a tierra que comprende un núcleo (10), un tubo (12) en donde se introduce la varilla (11) y una porción final (13) (Pág. 1, líneas 59 a 86).

El documento D3 ³ divulga una varilla para puesta a tierra que comprende una varilla central de aluminio, rodeada por un miembro tubular de fortalecimiento, que tiene más resistencia que el aluminio como una acero al carbono (resumen).

5. Examen de Patentabilidad (Art 14 D486)

El examen de patentabilidad que se muestra a continuación se realizó con base en las objeciones de claridad expuestas en el numeral 3 de esta comunicación.

Novedad (Art 16 D486)

La reivindicación 1 consiste en “La VARILLA ALUMINWELD PUESTA A TIERRA PARA

1 https://www.google.ca/patents/US3716649?dq=3716649&hl=es&sa=X&ei=WGgYVY_UlsqbgwT9p4CoBA&ved=0CB0Q6AEwAA

2 <https://www.google.ca/patents/US1980020?dq=1980020&hl=es&sa=X&ei=nWgYVeO2OYengwTk1IKoBA&ved=0CB0Q6AEwAA>

3 <https://www.google.ca/patents/US3876819?dq=3876819&hl=es&sa=X&ei=w2gYVdh3kOeDBPfJgaAE&ved=0CB0Q6AEwAA>

DESCARGA ELÉCTRICA se CARACTERIZA porque el acero se ha recubierto con aluminio...” (ver página 13 incluida en el radicado bajo No. 13-284264-00002-0000).

Comparación de las características técnicas **esenciales**, con las del Estado de la Técnica:

Características esenciales	D1	D2	D3
Varilla para puesta a tierra caracterizada por:	Varilla para puesta a tierra caracterizada por:	Varilla para puesta a tierra caracterizada por:	Varilla para puesta a tierra caracterizada por:
Acero se ha recubierto con aluminio.	Una envoltura tubular de pared delgada (2), un miembro tubular conductor (4) y un núcleo (6) (Fig. 1; Col. 3, líneas 31 a 56)	Un núcleo (10), un tubo de material de alta conductividad (12) en donde se introduce el núcleo (10) (Pág. 1, líneas 59 a 83).	Una varilla (4) rodeada por un miembro tubular (6) (Col. 2, líneas 6 a 11).

Las características **esenciales** de la varilla de la reivindicación 1 habían sido divulgadas previamente en D1, D2 y D3. En consecuencia, la reivindicación 1 no es nueva. Cabe aclarar que el acero y el aluminio mencionados en la reivindicación 1, no se pueden tener en cuenta en el examen de patentabilidad por las razones expuestas en el numeral 3 del presente documento.

En cuanto a la reivindicación 2, los documentos antecedentes enseñan las características técnicas que reclama, al enseñar: una punta de conducción (8) (D1=Fig. 1; Col. 3, línea 51), una punta (14) (D2=Fig. 15) y una punta de conducción (10) (D3=Fig.1; Col. 2, líneas 16 y 17).

La reivindicación 3 no contiene característica susceptibles de patente, toda vez que es ampliamente conocido en la técnica que la descarga a tierra (alambre o cable) es prensado a la varilla para puesta a tierra mediante un conector de compresión entre otros⁴
⁵. En consecuencia, la descarga a tierra y el conector se consideran elementos implícitos en las varillas comprendidas en el estado del arte.

6. Conclusión

Los requisitos de Patentabilidad de la presente Solicitud están afectados así:

Ítem	Documento	Reivindicaciones afectadas	Requisito que afecta
D1	US 3'716.649	1 y 2	Novedad
D2	US 1'980.020	1 y 2	Novedad
D3	US 3'876.819	1 y 2	Novedad

⁴ <https://www.epm.com.co/site/Portals/0/Users/001/01/1/RA7-018.pdf>

⁵ [http://www.jvltida.com.co/\(herrajes\)conectores.php](http://www.jvltida.com.co/(herrajes)conectores.php)

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de treinta (30) días contados a partir del día siguiente de la fecha de notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Se invita al solicitante se sirva indicar, si así lo considera, su renuncia al término faltante de treinta (30) días para dar respuesta a este requerimiento y presentarla por escrito.

Finalmente, se le recuerda al solicitante que si como respuesta a este requerimiento llegara a modificar el capítulo reivindicatorio y éste contenga más de diez (10) reivindicaciones, no pagará la tasa de modificación voluntaria pero sí la correspondiente al pago por reivindicación adicional.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única No. 10 de 2001.



JOSÉ LUIS SALAZAR LÓPEZ
Director de Nuevas Creaciones (c)

El anterior requerimiento fue notificado por fijación en lista, de fecha 2015-05-26

Elaboró: Monica Andrea Gutierrez Almonacid
Revisó: Sonia Andrea Diaz Pirazan

[54] **GROUNDING ROD AND COUPLER THEREFOR**

[75] Inventors: George A. Smith, Waterbury; Harrison Stevens, Wallingford; Robert R. Walker, Wallingford; Gilbert D. Boyd, Wallingford, all of Conn.

[73] Assignee: Allegheny Ludlum Industries, Inc., Pittsburgh, Pa.

[22] Filed: March 16, 1971

[21] Appl. No.: 124,788

[52] U.S. Cl. 174/7, 16/108, 174/94 R, 287/108, 287/126

[51] Int. Cl. H01r 3/06

[58] Field of Search 174/2, 3, 4, 6, 7, 84 C, 90, 174/94 R, 126 CP, 84 R; 16/108; 287/75, 108, 109, 126; 339/276 R, 276 C

[56] **References Cited**

UNITED STATES PATENTS

2,838,593	6/1958	Scesa et al.	174/84 R
3,033,600	5/1962	Drysdale	174/94 R UX
934,711	9/1909	Chapman	287/75 UX
2,013,217	9/1935	Olmstead	174/94 R UX
2,022,977	12/1935	Quarles	174/94 R UX

2,799,721	7/1957	Floyd, Jr.	174/94 R
3,566,000	2/1971	Maurer et al.	174/7

FOREIGN PATENTS OR APPLICATIONS

250,812	4/1964	Australia	174/7
634,790	2/1962	Italy	174/7

Primary Examiner—Laramie E. Askin
Attorney—Vincent G. Gioia and Robert F. Dropkin

[57] **ABSTRACT**

Described herein is an electrical grounding rod comprising a thin-walled tube of a corrosion resistant steel, a conductor tube of aluminum or other suitable electrically conductive material to provide a low resistance path to ground and a core of a plastic-type filler within the inner tube, the core being sufficiently rigid to provide structural support to the thin-walled tube yet resistant enough to allow some bending of the rod to circumvent obstructions encountered in driving the rod into the ground. A driving point is provided to fit over one end of the rod to isolate the aluminum from the earth and to facilitate driving the rod into the ground. In an alternative embodiment an additional steel tube is provided within the conductor tube to form a three-wall or "sandwich" composite.

21 Claims, 5 Drawing Figures

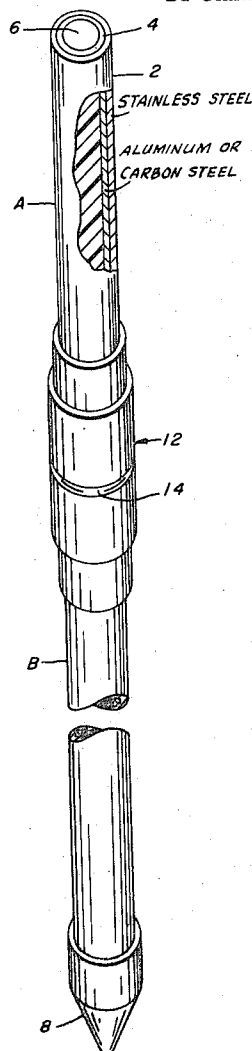
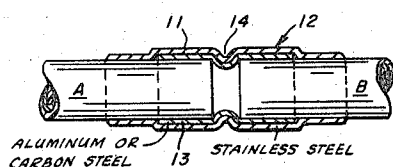


FIG. 1.

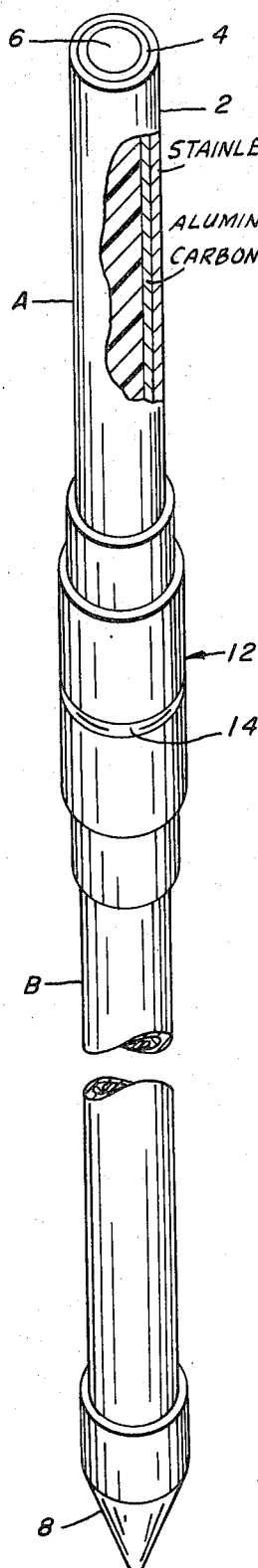


FIG. 2.

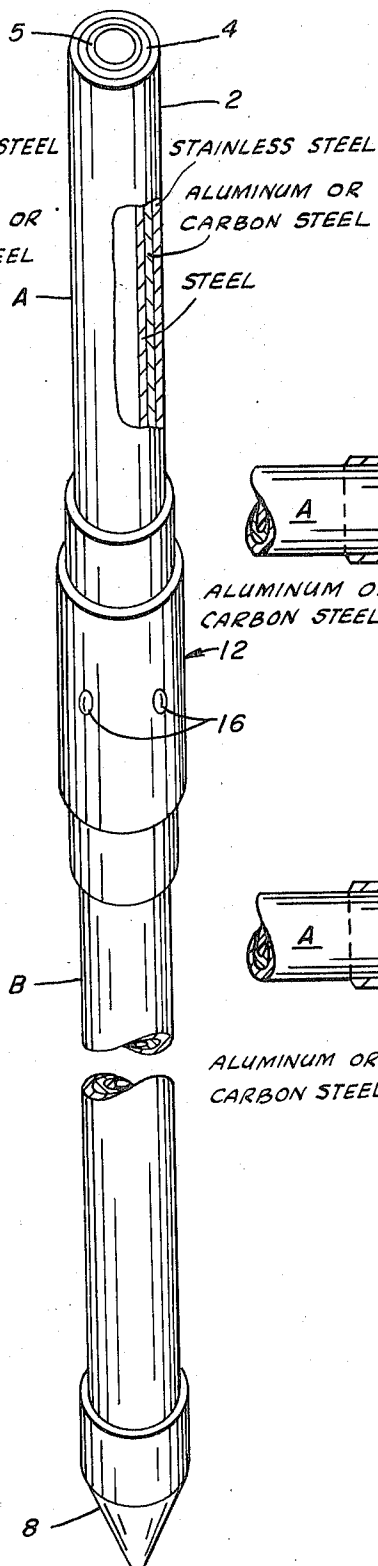


FIG. 3.

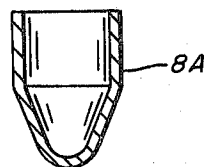


FIG. 4.

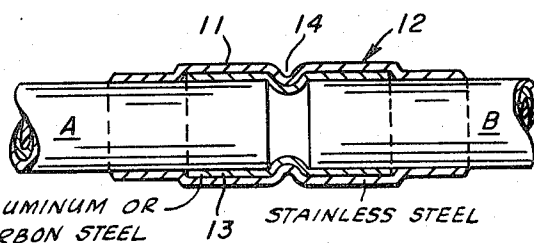
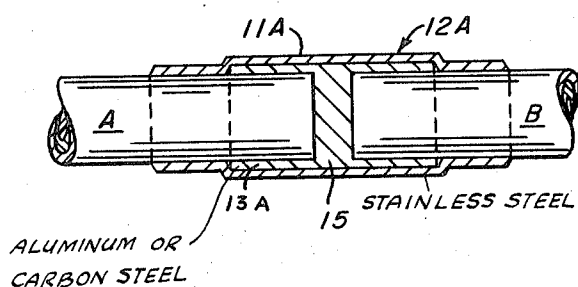


FIG. 5.



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GROUNDING ROD AND COUPLER THEREFOR

BACKGROUND OF THE INVENTION

Grounding rods have been used for many years for the protection of buildings and equipment against electrical discharge, such as lightning and fault currents. A number of designs are currently available, conventionally incorporating a solid type construction and frequently sheathed with a corrosion resistant material, such as copper. Additional types of grounding rods exist of high strength but lower conductivity. They are constructed of iron pipe and often filled with a material designed to cooperate with the ground waters in the location of the rod to promote the electrical contact of the rod since the iron pipe is itself a relatively poor conductor. There are numerous disadvantages suffered by these conventional grounding rods. Solid rods of highly conductive material are expensive. Quite often high conductivity materials are soft and rods of these materials may buckle or mushroom readily if they encounter an obstruction while being driven into the ground. The inclusion of holes in a rod as is conventionally done to promote dissolution of filler materials with the earth and electrical conductivity between the electrical conductor and the ground, may further weaken the rod and reduce its utility in areas where the earth into which the rod must be driven is fairly hard.

An additional disadvantage of conventional grounding rods was inflexibility. Often, obstructions were encountered in driving rods into the ground. Conventional rods tended to buckle with further driving and frequently the surplus of the rod above the ground which is unable to be driven further is cut off leaving a ground rod of improper length. More recently, a grounding rod was developed which avoided many of the disadvantages of prior devices. This rod is described in U.S. Pat. No. 3,566,000 dated Feb. 23, 1971, and comprises a thin-walled stainless steel tube filled with a resilient plastic material. Such a rod is both sufficiently sturdy and resilient and can effectively handle current surges of limited magnitude. However, no sooner are devices developed for specific applications, than new demands are made for still further improvements. The grounding rod of U.S. Pat. No. 3,566,000 although useful for current surges up to those normally necessary for residential protection, does not provide a sufficient margin of safety for various industrial applications.

Thus, there still exists a need for a grounding rod exhibiting a high conductivity, strong construction, of low cost material which is easily manufactured, which is substantially non-corrosive in the earth environment and which is able to handle very large current surges such as may be required in utility and industrial power applications but will not buckle when encountering moderate obstruction in the ground even when segments are coupled into longer lengths. Although some prior ground rods such as those described in Australian Pat. No. 250,812, contemplate coupled segments, no consideration is given to protecting the conductor from the surrounding earth or from galvanic cell conditions. In our coupling, the electrically conducted tubular member, e.g., aluminum, plain carbon steel, etc., is a metal less noble (i.e. anodic) with respect to stainless steel. The corrosion resistant steel shield protects the conductive member and substantially prevents

establishment of an electrolytic cell which would sacrificially deteriorate the conductive member.

SUMMARY OF THE INVENTION

The present invention provides an electrical grounding rod in one embodiment comprising a thin-walled, tubular sheath or envelope or corrosion resistant steel, a tubular shaped conductor member and a supporting core of semi-rigid, resilient material nonreactive with the envelope or conductor member and with the environment in which the rod is placed. Advantageously, the core material is put into compression within the tube. In a second embodiment, the grounding rod comprises a three-wall or "sandwich" composite additionally including an inner steel tubular supporting member inside the rod sandwiching the conductor tube within the corrosion resistant steel shield. In this embodiment the plastic core may be omitted since the inner supporting member supplies sufficient additional strength.

A driving point for the rod is provided at one end of the rod to assist in circumventing obstructions while the rod is driven into the earth and to isolate the conductor member from the earth. Also, a removable cap member, e.g., driving cap, adaptable to specific driving tools may be provided at the opposite end to distribute the forces of driving to prevent distortion of the rod. Upon completion of driving, a driving point member may be used for a cap to protect the rod interior from the elements. In addition to the foregoing, the invention includes a special section-coupler to join grounding rod lengths together, as necessary, to provide the total length desired for any particular application. Two types of section-couplers are useable: one is a tubular unit and the other may include a solid cross section. Both types are hereinafter described.

DESCRIPTION OF THE DRAWINGS

FIGS. 1 and 2 illustrate, by elevational views partly in section, two preferred embodiments of the grounding rod assembly of the invention, and

FIG. 3 is a cross-sectional view of an alternative driving point, and

FIGS. 4 and 5 are cross-sectional views of section couplers in accordance with the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The multi-component ground rod of the invention utilizes a stainless steel outer layer or tube called an envelope, sheath or shield, for columnar strength, corrosion resistance and satisfactory conductivity over a long period of time because corrosion products will not build up on the stainless steel ground rod and inhibit conductivity with the earth. The conductor, which may be mild steel or aluminum, is also a tube within the shield tube, and conducts the electric current the length of the rod without excessive heat buildup. The conductor tube also provides some added columnar strength at a minimum increase in weight. When present, the plastic or other resilient core material preferably is under compression within the conductor tube. The core material helps prevent premature collapse of the tube in columnar compression, prevents

mushrooming during the driving of the rod and prevents moisture from accumulating within the rod. An alternative embodiment utilizes an internal thin wall, steel supporting tube in lieu of or in addition to the plastic core to provide added strength for the rod assembly with minimum increase in weight.

Galvanic corrosion of ground rods may lead to failure of the ground to adequately serve its original purpose. The U.S. Navy report "Field Testing of Electric Ground Rods AD702040 Naval Civil Engineering Laboratory, Port Hueneme, California, February 1970," recommends stainless steel sheathed ground rods for general use because they are more resistant to general corrosion than other rods in common usage. The multi-component rods described above provide the resistance to corrosion, the conductivity, and the drivability required and weigh less than half of bi-metal rods of the same dimension.

These multi-component electric ground rods described above have the advantages that they will not galvanically attack adjacent steel or iron structures such as tanks, anchor rods, pipe lines or foundation bolts. These multi-component rods can be coupled without threading or other fabrication or modification and are designed to be used with a separate driving point that facilitates driving and seals the conductor tube and plastic from contact with the earth. The driving points can also be used as end caps or closures to seal the upper end from the atmosphere or earth.

Referring now to FIGS. 1 and 2, reference numeral 2 indicates a thin-walled tubular envelope or corrosion resistant steel. The tube in the figure is cylindrical in shape, however, it may have other cross sections including polygonal and the word "tubular" is intended in its broadest sense. Tube 2 may be a seamless extruded tube, a welded tube or one which is lockseamed or similarly joined. The diameter and length are generally dependent upon the electrical grounding requirements for the installation. A typical size would be a five-eighths inch diameter tube, 8 feet long. Numeral 4 indicates the tubular electrical conductor member which may be of any suitably conductive material considering the current surges anticipated but in the preferred embodiment is plain carbon steel or aluminum or aluminum alloy. The term "aluminum" as used herein is understood to include aluminum alloys. Two rod segments, A and B, are shown in the drawings connected by a coupler 12, hereinafter described, and as having a driving point 8. The rod in FIG. 1 has a plastic core 6 which is replaced in the rod of FIG. 2 with an inner steel tube 5. In our invention, "thin-walled tubes" are used and stainless steel and aluminum tubes through 0.05 inches and carbon steel tubes through 0.065 inches are included in this term.

Though other materials may provide adequate conductivity and strength characteristics for the shield, in accordance with the invention a corrosion resistant steel such as a stainless steel (e.g., AISI Type 304) is used. Such a material provides additional strength and nonreactive properties which allows minimizing the use of expensive conductive materials, yet provides additional characteristics described below. Grounding rods of our invention may be constructed with very thin tube walls, i.e., less than 0.07 inches. Typical of the practice of our invention is the use of a stainless steel tube hav-

ing a wall thickness of as little as 0.030 inches. Such structures contribute substantially to the objectives of reducing cost and provide a facility to circumvent obstructions when being driven into the ground. Only corrosion resistant steels provide the combination of properties and economy which permits construction of a tubular shield strong enough to be driven into the ground when supported internally, yet flexible enough to be able to circumvent moderate obstructions encountered during pounding into the ground. The aluminum or carbon steel tubular conductor member may be of any wall thickness capable of providing low impedance to grounding. A common wall thickness is about 0.035 inches.

As mentioned above, the illustration shown in FIG. 1, conductor tube 4 is filled with a supporting core 6 nonreactive with the shield 2 and conductor 4 and the earth environment. Materials known as "plastics" may be advantageously utilized, however, the material need not be organic. The necessary characteristics of the core material are:

1. that it be nonreactive with the corrosion resistant steel shield and tubular conductor, e.g., carbon steel or aluminum, and the earth environment,

2. that it provide a sufficiently rigid support when in position within the tube so that the filled tube may be driven into the ground, and

3. that it be slightly resilient so as to allow some bending of the composite rod. If core 6 is in compression, its value is enhanced by ensuring the tube is supported over its entire inside diameter.

In one embodiment of the grounding rod the conductive tube 4 may be filled with a flowable core material such as an epoxy, a polyurethane or an elastomer which is solidified or hardened within the tube. In order to achieve a core which would be in a condition of compression when solidified within the tube, the optimum flowable material would be one which would expand slightly as it solidified. This would eliminate an additional step of placing the core in compression such as by compressing the ends of the core, after solidification to achieve this condition.

The grounding rod of the invention has a separate driving point 8 affixed to one end of the tube 2. Such an attachment facilitates driving the rod into the earth with a lesser driving force and prevents direct contact of aluminum conductor with earth which could cause corrosion of the conductor. As a preferred alternative to a sharply pointed detachable driving point, the driving point 8 may present a rounded aspect, 8A, such as shown in FIG. 3. Such a rounded point encourages the rod to slide slightly to one side or the other in the event an object is encountered below the earth level while driving the rod.

The combination of the strong, thin-walled tube, a thin-walled conductor tube and a semi-rigid core permits some flexing of the rod further enhancing the ability of the driven rod to pass an obstruction without collapse of the rod. The higher strength of the corrosion resistant steels inhibits splitting, tearing and collapse of the tube while the thin walls allow some flexing without buckling and the conductive tube enables the rod to handle very large current surges.

The semi-rigid core supports the assembly uniformly throughout the inside diameter while also flexing to ac-

comodate a path around ground obstruction. More rigid, less resilient cores, such as compressed wood, concrete, etc., and thicker wall construction add to its weight and restrict flexibility of the rod and its ability to circumvent obstructions and thus encourage buckling. More ductile tube materials such as copper provide insufficient wall strength to retard buckling or protect against splitting and tearing of the rod during the driving.

As indicated above, the grounding rod may be constructed with a thin-walled, inner supporting tube which may replace the plastic core and which has certain advantages thereover, such as reducing electrical impedance and withstanding higher temperatures although the plastic core has the important practical advantage of less weight. The supporting tube may be of any steel composition, including plain steel and furnish considerable strength by forming a sandwich wall for driving into the ground, particularly in hard ground and for longer rod lengths.

The rod assembly shown in FIG. 2 has the same type of corrosion resistant shield 2 and conductor tube 4 but additionally includes a supporting tube 5, which together with shield 2 sandwiches conductor tube 4. In almost all other respects the rod assembly is the same as that shown in FIG. 1. The core 6 is omitted in the FIG. 2 rod assembly, but such a core may be included if found desirable in a given design to provide further columnar strength and integrity. Both the driving point 8 and the cap member may be the same in each embodiment as well as the section couplers, hereinafter described.

Frequently, it is necessary to provide relatively long lengths of grounding rod. To meet this requirement, it is preferred that the rods be manufactured in sections which can be conveniently handled, e.g., nominally 8 feet, and then are connectable in the field. In order to join sections of grounding rod it is necessary that some coupler be provided which does not detract from the rod's advantages and which meets the electrical conduction requirements.

Two types of section-couplers are provided. Both couplers are capable of mechanically and electrically joining sections of grounding rods for the purpose of extending said ground rods to depths in the earth greater than the usual eight feet in order to achieve the desired electrical circuit resistance to ground.

Basically, the couplers, as shown in FIGS. 4 and 5, comprise a tubular portion or envelope of the same material as the outer sheath of the ground rod itself, and the I.D. of the tubular portion of such dimension to provide a force fit over the rod sections so as to make a good electrical and mechanical connection. It is also possible, however, to use plastic or other corrosion resistant material for the tubular portion. Within the tubular portion of the coupler is a conductor member of electrically conductive material, preferably the same material or similar material to that of the tubular conductive member 4. The conductor member may be hollow or solid and fits tightly within the tubular portion, where it is firmly held at about the midpoint of said tubular portion by either mechanical means such as by rolling a groove as shown in FIG. 4, by one or more indentations or by welding or brazing. The purpose of the conductor member is:

1. to provide an electrical conduction path for more of the current to flow from ground rod Section A to Section B;

2. to provide a thermal heat sink for the thin-wall sheath, so that it can handle high electrical currents without undue heating or melting.

In ground rod couplings 12 and 12A shown in FIGS. 4 and 5, the slight increase in diameter of the coupling over the diameter of the ground rod provides better ground contact after driving than existing larger outside diameter couplings. In coupling 12, the conductor tube 13 in the coupling (FIG. 4) is retained within the shield 11 by the tight fit thereof, the reduced diameter of the shield tube at both ends and the annular indentation 14. The ground rod sections, A and B, fit into the coupling and rest against the interior stop formed by the annular indentation 14 (FIG. 4).

The coupling 12A shown in FIG. 5 is similar but includes a portion 15 which extends across the diameter of the shield 11A, acting as a stop for rod segments A and B. In this illustration, portion 15 is an extension of conductor tube 13A which may be formed by upsetting this tube. However, separate slugs also can be used which are retained in position by dimpling or rolling an annular indentation as shown in FIG. 4, into the portion. In this connection it is noted that the illustration in FIG. 1 depicts an annular indentation 14 while the rod assembly of FIG. 2 depicts a dimpled indentation 16. Normally, these and other retaining techniques may be used in the alternative. It should be further noted that an alternate embodiment of the coupling 12, FIG. 4, would be constructed with two annular indentations 14, spaced approximately three-quarters inch apart, or one wide annular indentation. When the rod segments A and B are assembled in this embodiment a cavity of suitable length, e.g., approximately 1 inch long, can be formed between each rod end. This cavity allows for any expansion of the resilient core 6, FIG. 1.

In the several embodiments, the coupling employs an outer shield, preferably of the same material as the shield 2 of the rod, to protect the conductor tube part of the coupling. Without such protection, the couplings would represent potential weak points in the overall grounding rod assembly, both with respect to driving into hard ground and for corrosion purposes.

Electrical tests have shown that without the conductor member feature, the coupler as described above can be the limiting factor in the current capabilities of the interconnected ground rods. Tests on couplers as shown in FIGS. 4 and 5 but without the conductor member indicate that currents in the order of magnitude of 7,500 amps for 12 cycles of 60 hz power (one-fifth sec.) can cause the section between the ends of the individual ground rod (the rolled groove) to heat to such a magnitude as to melt and disintegrate. With the addition of the conductor member, the coupler can handle much higher currents for longer periods of time.

The electrical tests also showed that when the plastic filled ground rod is subjected to very high currents the plastic filler can expand out the ends, and if the current and length of time are sufficiently great, the filler will melt, smoke and/or catch on fire. The expanding of the plastic also makes it difficult to couple sections of rods together for deep ground penetration.

By inserting a thin-walled conductor section of a better conducting material between the stainless sheath and the plastic core, the electrical resistance of the rod is vastly reduced and hence heating is reduced. Tests have shown that five-eighths inch diameter $\times$ 0.030 inch stainless tube with a 0.035 inch aluminum conductor and plastic core, exhibits a temperature rise of less than 250°F., when subjected to a current of 13,600 amps for 6 cycles (one-tenth sec.). A stainless-plastic rod, when subjected to only 3,200 amps for 6 cycles (one-tenth sec.) reached approximately the same temperature. At 11,630 amps for 5.8 cycles (one-tenth sec.) a stainless-plastic rod burned apart at the center with considerable smoke and flame.

In other tests:

A composite stainless-aluminum-plastic rod was subjected to 26,600 amps for 5.5 cycles (of 60 hz power) approximately one-tenth sec. with a resulting temperature rise of <500°F. No damage to rod and only a very small extrusion of plastic filler was observed.

A rod with a 0.043 inch plain carbon steel conductor tube within a stainless sheath also exhibits good properties although the temperature rise for a given current is greater than with an aluminum conductor tube. At 20,700 amps for 5½ cycles (approximately one-eleventh sec.) a temperature rise of between 1,000° – 1,250°F. resulted with 5 inches of plastic filler extruded from one end but there was no smoke or flame. Hence it appears that either an aluminum or steel inner conducting tube would be satisfactory to handle currents in the order of magnitude of 15,000 amps for 6 cycles (one-tenth sec.).

The data presented in Table I further illustrates the results obtained with grounding rods of the present invention compared with rod assemblies of just stainless steel tubing and plastic core. In the table, rod type 6105 is the stainless steel-plastic assembly; 6135B is the stainless steel-aluminum-plastic assembly; 6125B is the stainless steel-carbon steel-plastic assembly and 61320 is the three-wall stainless steel-aluminum-carbon steel assembly. The rods tested were 4 foot lengths except for the 61320 rod which was an 8-inch section, five-eighths inch O.D.

TABLE I

Rod Type	Avg. Current Amps	Peak Time Cycles	Temp. °F.	Comments
6105	3,200	6	<250	4 feet length of rod tested. Warm to touch.
6105	11,200	4.8	2250–2500	A small hole was burnt through the steel at one end of the sample close to the connecting clamp. Vaporized plastic ignited with considerable smoke and flame from the rod ends.
6105	11,630	5.8	>2500	The tube burnt apart in the center with considerable smoke and flame from the filler.
6135B	4,260	6	<250	No noticeable effect.
6135B	12,100	6.5	<250	Warm, no other noticeable effect.
6135B	26,600	5.5	<500	1½-inch filler extruded, no smoke or flame.
6125B	12,400	6	200–500	Warm, no other effects.
6125B	16,250	5.5	250–500	Filler extruded 1 inch at one end.
6125B	20,700	5.5	1000–	

1250 5 inch filler extruded, no smoke or flame.
600 No other effects

61320 19,500 29

The following data is for couplings shown in FIG. 4 with conductor section.

6135B 17,000 21.5

FIG. 4 coupling — no heating of coupling — slight discoloration of rod section.

6135B 15,000 26

Table II summarizes the results of the foregoing and of other tests and gives a clear picture of the relative capabilities. It can be seen that the stainless steel-plastic assembly (6105) is limited by parting of joints due to expansion of the plastic and by the core ignition point. The lower resistance types (6135B and 6125B) are limited by the parting of joints. The numbers which appear in Table II are I²t (current in amps (squared) times cycles) values. It is apparent that rods and couplings of the invention are vastly superior and can attain an I²t greater than 1,000 or even 2,000 (times 10⁶) before a polyethylene filler ignites and coupled segments part due to core expansion.

TABLE II

Rod Type	Filler* Extrudes	Joints* Part	Filler* Ignites	Tube* Melts
6105	≥ 188	>294	≥ 508	≥ 785
6125	≥ 1,450	>2,900 estd	≥ 4,840	≥ 8,400 estd
6135B	≥ 3,890	>4,500 estd	≥ 8,190	≥ 13,000 estd

*I²t values in millions (10⁶)

The sandwich wall rod (Type 61320) without the core can withstand even greater I²t values than shown for the 6135B rod in Table II, since it is not limited by core behavior. An 8 foot section of five-eighths inch O.D. of this rod has an Ohmir resistance of 0.00154 (0.03 inch stainless steel, 0.03 inch aluminum and 0.049 inch carbon steel).

In the preferred method of assembling the grounding rod, the grounding rod may be formed by drawing an aluminum tube over a pliable rod of material such as polyethylene. By example, the diameter of the core may be the same outside diameter as the conductor tube to be drawn over it. By drawing the thin-walled tube 2 over the conductor tube and the core 6, the core is put into compression which provides the entire composite with rigidity and serves as an additional force to counteract any tendency for the wall to collapse during driving impact. A further embodiment utilizing a pliable rod 6 such as a polyethylene may be formed by inserting the rod 6 into a slightly larger tube and drawing the filled tubes 4 and 2 through a die "shrinking" them or reducing them in diameter sufficiently to place the core 6 in compression. This method may be employed advantageously when the tube material is less workable, such as stainless steel tubing. A further alternate method of manufacturing a grounding rod of a thin-walled tube having a nonreactive core may be by extru-

sion. The core 6 may serve as a mandrel over which the tubes 4 and 2 would be pushed. It is to be noted that the core would have to be sufficiently rigid to withstand the push of the tubes over it. Depending upon the workability of a tube of particular steel and wall thickness, one of the above methods may be a more desirable method of manufacture.

We claim:

1. An electrical grounding rod assembly comprising a thin-walled tubular shield of stainless steel, a thin-walled tubular conductor of aluminum within said tubular shield, a core of semi-rigid material substantially filling said tubular conductor, driving point means at one end of said tubular shield which facilitates penetration into ground and substantially precludes direct contact between said tubular conductor and the ground, said assembly being flexible but sufficiently rigid to be driven into the ground.

2. An electrical grounding rod assembly according to claim 1 wherein said core is a plastic.

3. An electrical grounding rod assembly according to claim 1 wherein said core is a hardened, expanded, flowable material.

4. An electrical grounding rod assembly comprising a plurality of rod segments, each segment comprising a thin-walled tubular shield of corrosion resistant steel, a thin-walled tubular conductor of low impedance metal within said tubular shield, a core of semi-rigid material substantially filling said conductor tube, a rod segment coupling means between adjacent segments, said coupling means comprising an outer protective tubular envelope of corrosion resistant material, a thin-walled tubular conductor of low impedance metal within said tubular envelope in substantially fixed relation thereto, the ends of said outer protective envelope extending beyond said tubular conductor and engaging the thin-walled tubular shields of said rod segments so as to completely cover and protect said tubular conductor including the end edges thereof, stop means intermediate the ends of said tubular conductor, the ends of said rod segments to be coupled being disposed within said coupling means such that said tubular conductor overlaps said rod segment ends and forms an electrical connection therewith, said stop means of said coupling serving to substantially delimit the extent to which said rod segments may extend into said coupling; driving point means on one end of said tubular shield which facilitates penetration into ground and substantially precludes direct contact between said conductor tube and the ground, said assembly being flexible but sufficiently rigid to be driven into the ground.

5. An electrical grounding rod assembly according to claim 4 wherein said stop means in said coupling is at least one indentation in said tubular conductor.

6. An electrical grounding rod assembly according to claim 4 wherein said stop means is a slug extending across the diameter of said tubular conductor.

7. An electrical grounding rod assembly according to claim 6 wherein said slug is a portion of said tubular conductor.

8. An electrical grounding rod assembly according to claim 7 wherein said envelope is stainless steel and said conductor tube is a material from the group consisting of aluminum and carbon steel.

9. An electrical grounding rod assembly comprising a thin-walled tubular shield of corrosion resistant steel, a thin-walled tubular conductor of low impedance metal within said tubular shield, a thin-walled tubular supporting member within said tubular conductor and forming a three-wall composite with said shield and tubular conductor, driving point means on one end of said tubular shield which facilitates penetration into ground and substantially precludes direct contact between said conductor tube and the ground, said assembly being flexible but sufficiently rigid to be driven into the ground.

10. An electrical grounding rod assembly according to claim 9 including a plastic core within said tubular supporting member.

11. An electrical grounding rod assembly comprising a plurality of rod segments, each segment comprising a thin-walled tubular shield of corrosion resistant steel, a thin-walled tubular conductor of low impedance metal within said tubular shield, a tubular supporting member within said tubular conductor and forming a three-wall composite with said shield and tubular conductor, rod segment a coupling means between adjacent segments said coupling means comprising an outer protective tubular envelope of corrosion resistant material, a thin-walled tubular conductor of low impedance metal within said tubular envelope in substantially fixed relation thereto, stop means intermediate the ends of said tubular conductor, the ends of said rod segments to be coupled being disposed within said coupling means such that said tubular conductor overlaps said rod segment ends and forms an electrical connection therewith, said stop means of said coupling serving to substantially delimit the extent to which said rod segments may extend into said coupling; driving point means on one end of said tubular shield which facilitates penetration into ground and substantially precludes direct contact between said conductor tube and the ground, said assembly being flexible but sufficiently rigid to be driven into the ground.

12. An electrical grounding rod assembly according to claim 11 wherein said stop means in said coupling is at least one indentation in said tubular conductor.

13. An electrical grounding rod assembly according to claim 11 wherein said stop means is a slug extending across the diameter of said tubular conductor.

14. An electrical grounding rod assembly according to claim 13 wherein said slug is a portion of said tubular conductor.

15. An electrical grounding rod assembly according to claim 11 wherein said tubular envelope of said coupling means is longer than said tubular conductor and extends beyond each end thereof to engage said ground rod segments to substantially protect said tubular conductor of said coupling from corrosive contact with surrounding ground.

16. An electrical grounding rod assembly according to claim 11 wherein said envelope is stainless steel and said conductor tube is a material from the group consisting of aluminum and carbon steel.

17. An electrical grounding rod assembly according to claim 11 wherein said tubular supporting member is steel.

18. A coupling device for joining grounding rod segments comprising a hollow, elongated envelope of

11

stainless steel, an at least partially hollow conductor member of aluminum within said envelope and in substantially fixed relationship therewith, the envelope extending beyond the edges of the conductor member and being bent inwardly at said edges to protect the same, and stop means intermediate the conductor member adapted to substantially delimit the extent to which said rod segments may extend into said at least partially hollow conductor member.

12

19. A coupling device according to claim 18 wherein said stop means in said coupling is an indentation in said conductor member.

20. A coupling device according to claim 18 wherein said stop means is a slug extending across the diameter of said conductor member.

21. A coupling device according to claim 20 wherein said slug is a portion of said conductor member.

* * * * *

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Nov. 6, 1934.

W. R. WEBSTER

1,980,020

GROUND ROD

Filed Aug. 24, 1931

Fig.1.



Fig.2.



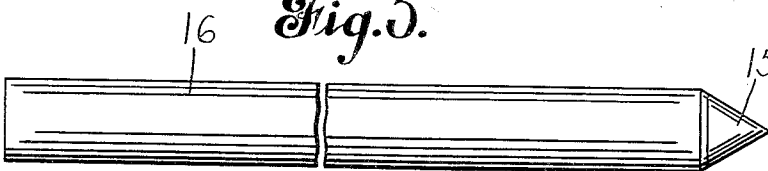
Fig.3.



Fig.4.



Fig.5.



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UNITED STATES PATENT OFFICE

1,980,020

GROUND ROD

William R. Webster, Bridgeport, Conn.

Application August 24, 1931, Serial No. 559,027

1 Claim. (Cl. 173—31)

This invention relates to what is commonly known as a ground rod. It is often necessary in connection with electrical wiring to effectively ground certain circuits or parts of circuits. This is true with respect to many electrical installations, and in connection with the operation of overhead electrical circuits for railways and the like, it is necessary to provide at intervals a conducting connection between lightning arresters and other devices and the ground. To effect this end it is convenient to drive into the ground a metal rod, which may be six or eight feet in length. This rod must, of course, comprise conducting material and in the usual instance the top of the rod projects above the ground for several inches when installed, and secured thereto is a wire or suitable conductor which is electrically connected to the device or circuit which it is desired to ground.

It is desirable that the rod so used shall be long enough to extend some distance beneath the surface and preferably to project into the moist layers of earth so that a good ground connection will be had. It is, therefore, necessary that the rod should be as stiff and rigid as possible so that it may be driven into relatively hard or resistant soil without bending or buckling. It is also necessary that the rod should have good electrical conductivity.

One object of this invention is the provision of an improved ground rod which shall be relatively stiff and rigid and which will have good electrical conductivity.

Another object is to provide a strong inexpensive structure in which the rod has a core of ferrous metal and a thin coating of copper or like metal intimately adhering to the core so as to prevent shucking or displacement of the coating relatively to the core and any looseness between said parts.

To these and other ends the invention consists in the novel features to be hereinafter described and claimed.

In the accompanying drawing:

Fig. 1 is an elevational view of a rod which forms the inner portion or core of the completed article;

Fig. 2 is a similar view of the same rod after it has been subjected to a cold drawing operation;

Fig. 3 is a view of the assembled inner core and outer jacket, the assembly having been pointed or reduced at one end;

Fig. 4 shows the parts of Fig. 3 after completion of the operation of drawing the assem-

bly through a die to secure the outer covering or jacket upon the core; and

Fig. 5 is a view illustrating the completed rod.

In manufacturing a ground rod according to my invention, I prefer to use for the inner portion or core of the device a rod 10 shown in Fig. 1, which may be a section of an ordinary hot rolled steel rod. This rod is prepared for cold drawing in the usual or ordinary way, and then drawn in a cold state through a drawing die.

This results in a reduction of the diameter of the rod and also serves to harden it and greatly increase its rigidity and stiffness. The rod which results from this operation is shown at 11 in Fig. 2 of the drawing.

A tube 12 of material of high conductivity, such as copper, for example, having an inside diameter somewhat larger than the cold drawn rod 11 is then slipped over the rod 11 until the end of the tube is substantially flush with that of the rod. This end of the assembled rod and tube is then placed into a suitable pointing device and reduced in size or pointed as shown at 13. This pointing operation results in contracting the outer copper tube upon the rod and renders the end of the assembled tube and rod sufficiently small to be inserted through the opening of a die which is used in the next operation to be performed.

The end 13 of the assembled tube and rod is then inserted through the opening of a suitable drawing die. This pointed end is then grasped by means of draw bench tongs and the assembly is drawn through the die opening. This causes the tube to be reduced in size and to adhere tightly and securely to the surface of the inner steel rod, as shown at 14 in Fig. 4. It will be understood that as the inner steel rod has a relatively smooth exterior surface due to its preparation for the outer covering, the copper tube will be caused to adhere thereto so closely that in effect the two become parts of a unitary structure, that is, there is no danger of any movement of the copper tube or jacket with respect to the core when the rod is driven into the ground.

The rod which has been formed as described is then cut to the required length, which may be six or eight feet, for example, and is sharply pointed at one end, as shown at 15 in Fig. 5. This enables it to be readily driven into the ground when used.

Rods of various diameters may be made by the improved process heretofore described, the diameter, of course, depending upon the diameter of the inner core or steel rod and the thickness of the copper jacket or tubing. In making a $\frac{5}{8}$ inch

rod, for example, I find it convenient to use a hot rolled steel rod approximately $\frac{5}{8}$ of an inch in diameter. When this rod has been passed through the cold drawing operation and its diameter reduced, as shown in Fig. 2, it will be drawn to approximately .541 inch in diameter. The tube of copper slipped thereon, which is preferably a seamless tube, will have an outside diameter of about $\frac{3}{4}$ of an inch and have a wall approximately .055 of an inch in thickness. The assembled rod and tube may then be pointed, as shown at 13, so that the outside diameter of the assembly at the pointed end will be slightly less than $\frac{5}{8}$ of an inch. The assembled rod and tube may then be drawn through a die having a $\frac{5}{8}$ inch opening so that the outside diameter of the completed rod with its copper jacket will have a diameter of $\frac{5}{8}$ of an inch. Other sizes may, of course, be made from rods and tubes having corresponding dimensions. The tube of copper is quite thin, having a wall many times less thick than the diameter of the core, as only a thin outer shell of highly conductive metal is required, and on the other hand the reinforcement imparted by the hardened steel core is of such importance that this core should be of comparatively large diameter in order to give the article the requisite mechanical strength.

It will be apparent that the finished ground rod shown at 16 in Fig. 5 is of composite structure having an inner rigid and stiff core of relatively hard material and an outer covering or jacket of high conductivity. The union between the outer covering and the core will be of such

a character due to the method of manufacture that the tube and core will adhere tightly together and will to all intents and purposes be one and the same structure. It will be understood that when the tube is drawn upon the rod which forms the core, it will be forced or contracted upon the rod with considerable pressure so that the metal of the inner surface of the tube and the metal of the outer surface of the rod will become inter-engaged, i. e., with one extending into minute cavities of the other, thus binding the parts securely together.

While I have shown and described a preferred embodiment of my invention and a preferred method of manufacturing the same, it will be understood that it is not to be limited to all of the details or steps described, but modification and variation may be resorted to within the spirit of the invention and within the scope of the appended claim.

What I claim is:

A ground rod for connecting electrical apparatus to ground comprising a cold drawn core of relatively strong metal, said metal being a ferrous metal, and a cold drawn outer coating of weaker but more highly conductive metal conforming closely to the core, the wall of said coating being quite thin as compared to the diameter of said core and the inner surface of the coating being intimately engaged with and entering minute cavities of the surface of the core to form a substantially unitary structure, said rod having a conical end.

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[54] **GROUNDING ROD**
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 [73] Assignee: **Allegheny Ludlum Industries, Inc.,**
 Pittsburgh, Pa.
 [22] Filed: **Aug. 22, 1974**
 [21] Appl. No.: **499,736**

[52] U.S. Cl. **174/7; 29/191.6; 29/196.1;**
 29/196.2
 [51] Int. Cl. **H01r 3/06**
 [58] Field of Search **174/7, 126 CP; 29/191.6,**
 29/193, 196.1, 196.2; 52/155, 727

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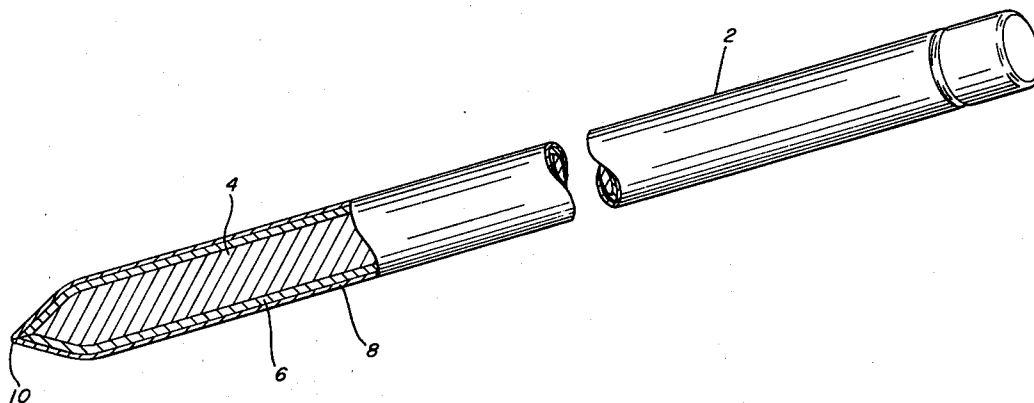
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Primary Examiner—Laramie E. Askin
Attorney, Agent, or Firm—Vincent G. Gioia; Robert F. Dropkin

[57] **ABSTRACT**

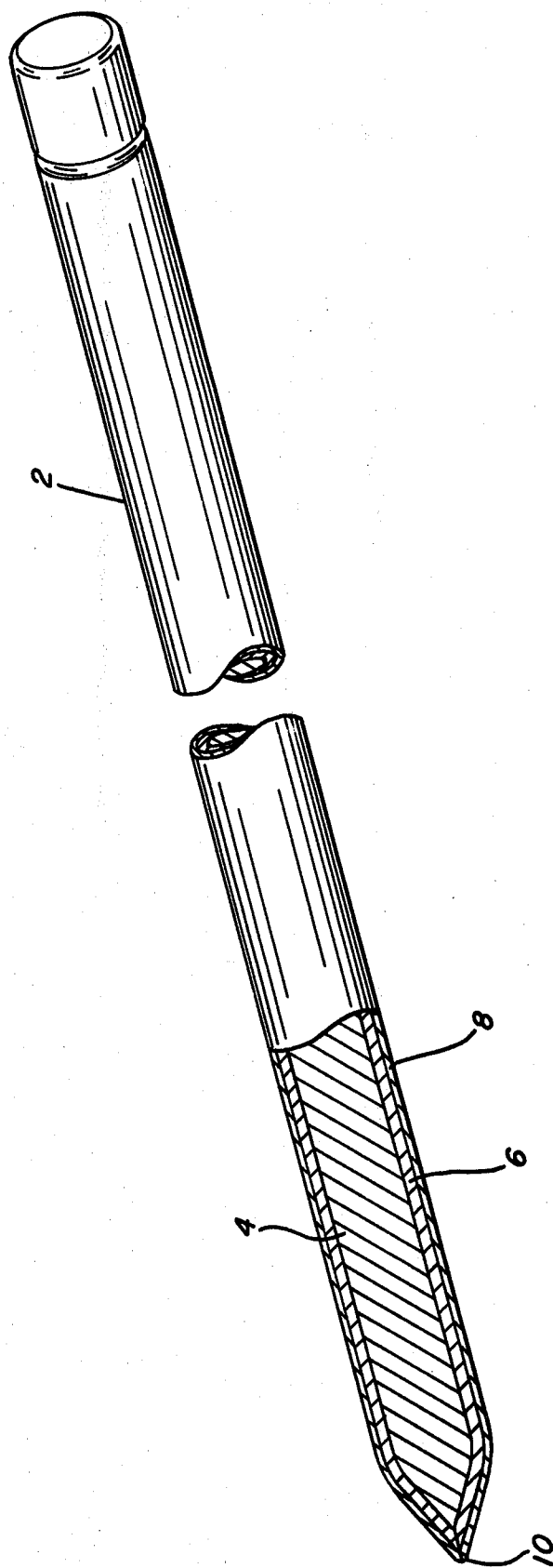
An electrical grounding rod comprising a central aluminum rod surrounded by and in intimate contact with a tubular strength member made of a material of substantially greater strength than aluminum such as plain carbon steel. A sheath made of a corrosion resistant conductive material such as stainless steel surrounds and is in intimate contact with the strength member.

9 Claims, 1 Drawing Figure



PATENTED APR 8 1975

3,876,819



GROUNDING ROD

This invention relates to an electrical grounding rod particularly for use in the protection of buildings and equipment against electrical discharge, such as lightning and fault currents. Many patented and unpatented designs of grounding rods have been used for many years and are being used at the present time. Related patents of which we have knowledge are Smith et al, U.S. Pat. No. 3,716,649 dated Feb. 13, 1973; Maurer et al U.S. Pat. No. 3,566,000 dated Feb. 23, 1971; Staples U.S. Pat. No. 2,207,134 dated July 9, 1940; Haig U.S. Pat. No. 2,068,545 dated Jan. 19, 1937, and Australian Pat. No. 250,812 Published May 2, 1963. All of the previous rods of which we have knowledge have various drawbacks. They may lack sufficient strength or rigidity to be driven into the ground, they may lack durability, their electrical conductivity may be poor, they may be heavy to handle and ship, and/or they may be expensive. The grounding rods of U.S. Pat. Nos. 3,566,000 and 3,716,649 referred to above have been unsatisfactory for some purposes such as for welding to a ground grid system because the plastic present therein flamed up and made the welding process dangerous and the weld unreliable. When driving the rod into the ground, it acts as a cantilever beam fixed at one end in the ground and the other end loaded with hammer blows. Thus, the greater the EI factor the less the deflection. For some reason it has been common practice in composite rods to place the more conductive but low strength material on the outside of the rod and the higher strength material toward the center. This utilizes the materials to obtain a low EI factor. We have found that we can place the lower strength material in the center without adversely affecting the conductivity of the rod while greatly increasing its stiffness. For example, if the same cross-sectional area of aluminum is used as a core, as in our invention, instead of as a tube having 0.567 inch outside diameter and a 0.103 inch wall and a carbon steel tube used around the aluminum core, rather than within an aluminum tube with the same cross-sectional area, the deflection per unit load would be only 1.58 inches as compared to 2.028 inches. Also the weight of an 8 ft. rod can be reduced more than a pound from rods of approximately equivalent electrical resistance and more than 2 pounds from rods of approximately the same stiffness but higher electrical resistance. We have also found that an aluminum tube sheathed by a carbon steel tube will corrode and will form a galvanic cell within itself and will be anodic to many metals in underground service. We have found that an aluminum rod sheathed by a strengthening member of carbon steel which in turn is sheathed by a corrosion resistant but conductive material does not form a galvanic cell within itself or readily with other buried metals, is resistant to underground corrosive attack, and can be readily brazed or fusion welded.

It is therefore an object of our invention to provide an electrical grounding rod which best utilizes its materials for maximum strength and/or electrical conductivity.

Another object is to provide such a grounding rod which is highly resistant to corrosion attack and does not readily form a galvanic cell.

Still another object is to provide such a grounding rod which is simple in construction and relatively inexpensive.

These and other objects will become apparent from the following description when taken in conjunction with the accompanying drawing in which the single FIGURE is a longitudinal view of the grounding rod with parts broken away and shown in section.

Referring more particularly to the drawings, reference numeral 2 indicates the grounding rod of our invention which includes a center aluminum rod 4 surrounded by and in intimate contact with a tubular strength member 6 made of a conductive material having substantially greater strength than aluminum. Plain carbon steel is preferred. Surrounding and in intimate contact with tube 6 is a corrosion resistant conductive sheath 8. This is preferably made of stainless steel such as Type 304 and has a substantially less wall thickness than tube 6. A driving point 10 may be attached to the rod in any usual manner or, as shown in the drawing, the point may be an integral part of the ground rod. In either case, the point is completely sheathed with stainless steel.

The tubes 6 and 8 may be drawn over the rod 4 in any well known manner by starting with a tube 6 of slightly larger inside diameter than rod 4 and slightly smaller outside diameter than the inside diameter of tube 8.

One particular rod 8 ft. long has a 0.437 in. solid aluminum rod, surrounded by a carbon steel tube having a 0.567 in. outside diameter and a 0.065 in. wall. A Type 304 stainless steel tube having a 0.625 outside diameter and a 0.029 in. wall surrounds the carbon steel tube. The rod has a resistance of 0.0006268 ohms and weighs 5 lbs. 11 ozs.

While one embodiment of this invention has been shown and described, various adaptations and modifications may be made without departing from the scope of the appended claims.

We claim:

1. An electrical grounding rod assembly comprising an aluminum rod, a tubular strength member surrounding and in intimate contact with said aluminum rod, said strength member being made of material having substantially greater strength than aluminum, and a tubular sheath surrounding and in intimate contact with said strength member, said sheath being made of a corrosion resistant conductive material.

2. An electrical grounding rod assembly according to claim 1 in which said strength member is made of carbon steel.

3. An electrical grounding rod assembly according to claim 1 in which said sheath is made of stainless steel.

4. An electrical grounding rod assembly according to claim 3 in which said strength member is made of carbon steel.

5. An electrical grounding rod assembly according to claim 1 in which the wall thickness of said sheath is substantially less than that of said tubular strength member.

6. An electrical grounding rod according to claim 5 in which said strength member is made of carbon steel.

7. An electrical grounding rod assembly according to claim 5 in which said sheath is made of stainless steel.

8. An electrical grounding rod assembly according to claim 7 in which said strength member is made of carbon steel.

9. An electrical grounding rod assembly according to claim 8 including a driving point at one end, said driving point being sheathed with stainless steel.

* * * * *

Search history

Search 1: TAC=(asa and triple and botella) (Results 0)
Search 2: TAC=(asa and botella) (Results 237)
Search 3: (2) AND IPC=(B65 OR B67) (Results 168)
Search 4: TAC=(asa and botella and plastic*) (Results 73)
Search 5: (4) AND PD>1994 (Results 61)
Search 6: FT=(ground road and coar) (Results 0)
Search 7: TAC=(ground road and coat) (Results 0)
Search 8: TAC=(ground rod and coat) (Results 3)
Search 9: TAC=(ground rod) (Results 953)
Search 10: TAC=(ground rod and aluminium) (Results 6)
Search 11: TAC=(ground rod and sleeve) (Results 83)
Search 12: FT=(varilla polo a tierra) (Results 0)
Search 13: FT=(varilla puesta a tierra) (Results 1)
Search 14: FT=(ground rod and aluminium) (Results 39)

Title: Improvements in barometric capsules

Abstract: Source: GB505885A 505,885. Barometers. LAURET, M. A. Oct. 8, 1938, No. 29224. [Class 106 (ii)] A barometric capsule comprises means for ensuring a mutual longitudinal guiding of the two ends through antifriction means without play and with minimum friction. In the form shown one end part 9 has rigidly secured thereto a rod 10 hardened and ground which is slidable between two sets of hardened rollers 11 loose on axles mounted on a socket 12 connected to the other end part 13. In a similar form the rod is engaged by balls carried on a tube between the rod and socket which is hardened and ground on the inside. In a still further form, the capsule is strengthened by an internal spring between the ends and balls are carried in recesses in a light metal cage between the rod and socket.

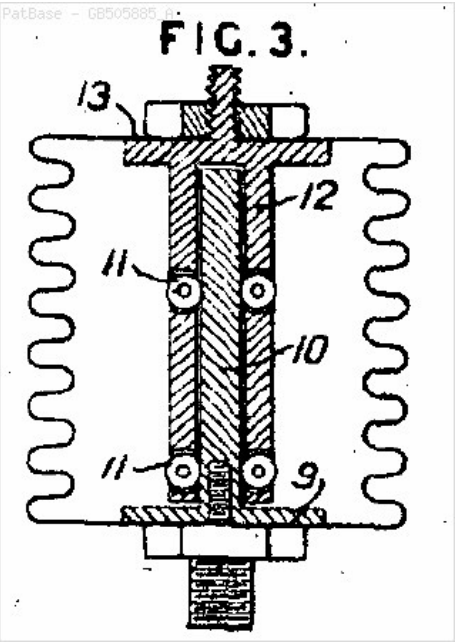
Classifications:

International (IPC 8-9): G01L7/00 (Advanced/Invention)

International (IPC 1-7): G01L7/06

CPC: G01L7/00

European: G01L7/00



Family:

Publication number	Publication date	Application number	Application date
GB505885 A	19390518	GB19380029224	19381008

Priority:

GB19380029224 19381008

Assignee(s): (std): MARIN ANDRE LAURET

Title: Improvements in wire and like grinders and to a method of abrasively processing wire and the like therein

Abstract: Source: GB712579A 712,579. Grinding wire and the like. ILLMER, L. Sept. 27, 1952, No. 24261/52. Class 60 A wire or like grinding machine comprises a tractor reel 10, Fig. 1A, grinding means 32 to treat a reel-oncoming portion of the wire 19, and two stator means 21A, 21B located at opposite ends of the reel 10 to support two series of rollers 20, 27, one roller series serving to thrust the last-laid coil in the axial direction of the reel and the other series being disposed to counteract the thrust imposed by the first series. Work-drive means. The wire 19 is formed into an endless loop with its abutting ends smoothly welded together and travels round a closed circuit including the reel 10, a slewmounted sheave 28, Fig. 1B, a triple-roller straightening device 36 and the grinding means 32. The reel is driven through reduction gearing by an electric motor 15A and has its periphery shaped as shown in Fig. 8, the oncoming wire being first wound on to a raised portion 17D from which the turns are successively displaced by the rollers 20 on to a portion 17H of reduced diameter. This portion may be of **aluminium** to provide low frictional resistance to the axial traverse of the coils towards a conical portion 17F on to which they are driven by a further series of rollers 37 so that the return run to the sheave 28 is tensioned. Two jacks 35 connected for simultaneous adjustment by a remotely-controlled, reversible electric motor displace the sheave 28 to establish any desired tension in the workpiece. The rollers 20 and 37 are held in contact with the reel by spring pressure while the two stators 21A, 21B are connected by rods 31 to form a cradle which may be rotated to bring a particular roller into position for servicing. Wedges (not shown) normally hold the stators against rotation. Grinding means. The means 32 are mounted in pairs on shafts 44 driven by toothed gearing from a shaft 41 directly rotated by an electric motor 43. A second shaft 42 driven by gearing from the shaft 41 is connected through further toothed gearing to an abrasive tape feeding mechanism mounted in each means 32. This mechanism comprises two tape supply reels 57A, 57B, Fig. 3, two tape feed rolls 50, two idler rolls 60 and two take-up reels 58 to drive two abrasive tapes 59 at constant speed. Each roller 50, which controls the tape speed; has a yieldable surface and co-operates with an auxiliary spring-pressed roller 56 to provide an adequate frictional grip on the tape while each take-up reel 58 is driven through a slipping cone clutch and mounted on an inclined axis to equalize the drag tension along both tape edges. Two shaped shoes each provided with tape guide rollers (not shown), a soft rubber cushioning strip 79, Fig. 7, and a thin metallic cover plate (not shown) to prevent wear of the strip are pivotally mounted on trunnions 74 to hold the tapes against the work. One of these trunnions is connected to a spring-loaded piston 73 which applies pressure to the work while the other is connected to a rod 88 which is radially adjustable to keep the work centralized. The whole of the tape feeding mechanism is housed in a drum 45B closed by a circular transparent cover provided with a central replaceable split bushing to guide the wire therethrough. When the drums are opened surplus ground particles may be dumped into storage pans (not shown). The supply and take-up reels are interchangeable to facilitate repeated use of a single tape and timing switch means may be connected to the motor 43 to reverse or stop the tapes when they are approaching their ends. The tapes are soaked in oil before use. Replacement of the workpiece. The renewal batch of wire is placed on a freely-mounted drum 94, the original splice of the prior batch severed by the use of a clamp 36A or the like and one terminal thereof attached to one end of the renewal batch while the other is threaded through a crimper device and attached to a take-off drum 95. The latter is then rotated by a motor 97 to drag the renewal batch through the machine. If the renewal batch is shorter than the original batch, the number of coils on the reel 10 is reduced by stopping the latter when the splice has reached a medial position thereon, clamping the splice to the reel 10 by a T-bolt, severing the original batch and running the motor 97 until the surplus coils have been removed, whereupon re-splicing is effected and the remainder of the original batch wound on to the drum 95. If the renewal batch is longer than the original, extra coils are wound on to the reel 10 by inching the latter over or driving it at reduced speed from an auxiliary motor 16A after severing and clamping have been effected in the manner described above.

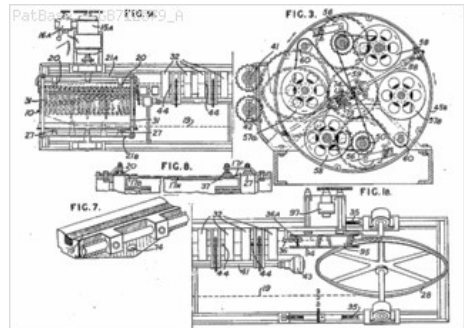
Classifications:

International (IPC 8-9): B24B21/02 (Advanced/Invention); B24B21/00 (Core/Invention)

International (IPC 1-7): B24B21/02

CPC: B24B21/025

European: B24B21/02B



Family:

Publication number	Publication date	Application number	Application date
GB712579 A	19540728	GB19520024261	19520927

Priority:

GB19520024261 19520927

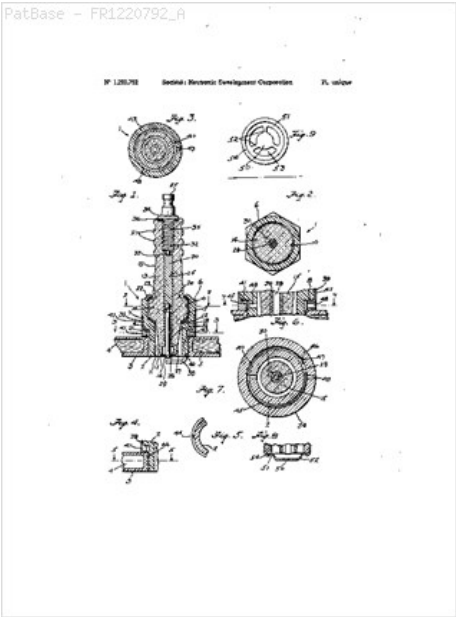
Assignee(s): (std): LOUIS ILLMER

Title: Perfectionnements aux dispositifs d'allumage pour moteurs a combustion interne Improvements to ignition devices for internal combustion engines (Machine translation)

Abstract: Source: FR1220792A (Claim 1) 1. Le dispositif d'allumage comprend un corps tubulaire metallique muni de moyens a une extremite pour le fixer sur un moteur a combustion interne, un isolant possedant un alesage central dans ledit corps et ayant une extremite substantiellement alignee avec ladite extremite dudit corps et l'autre extremite faisant saillie hors de l'autre extremite dudit corps, ledit isolant etant conique a ladite extremite pour former un espace entre l'isolant et les parois internes du corps, ladite extremite de l'isolant formant une jupe, et des conducteurs traversant ledit alesage, caracterise en ce qu'un etrangement est prevu dans l'alesage adjacent a ladite jupe, et que les conducteurs comprennent une tige ajustee dans ledit etrangement et faisant legerement saillie au-dela de ladite jupe pour former une des electrodes du dispositif, un element poreux conducteur de l'electricite en contact electrique avec ladite tige ajustee etroitement dans ledit alesage et remplissant ledit alesage jusqu'a un point proche de l'autre -extremite dudit isolant, ledit element ayant un coefficient eleve de conductibilite thermique, et des moyens d'arret pour retenir ledit element poreux dans ledit alesage en effectuant la connexion electrique audit dispositif;

Machine translation: (Claim 1) 1. The ignition device includes a tubular metal body having means at one end to attach it to an internal combustion engine, an insulator having a central bore in said body and having one end substantially aligned with said extremity of said body and the other end protruding from the other end of said body, said insulator to said end being tapered to form a space between the insulation and the inner walls of the body, said end of the insulator forming a skirt, and conductors passing through said bore, characterized in that a choke is provided in the bore adjacent to said skirt, and that drivers comprise a rod fitted in said choke and projecting slightly beyond said skirt to form one of the electrodes of the device, an element porous conductive electricity in electrical contact with said rod closely fitted in said bore and filling said bore to a point near the other end of said insulation-, said element having a high coefficient of thermal conductivity, and means for 'stop for retaining said element in said porous bore by making the electrical connection to said device;

Classifications:
International (IPC 8-9): H01T13/08 (Advanced/Invention);
H01T13/00 (Core/Invention)
International (IPC 1-7): F25D27/00
CPC: H01T13/08
European: H01T13/08



Family:

Publication number	Publication date	Application number	Application date
FR1220792 A	19600527	FR19590793641	19590430

Priority:

FR19590793641 19590430

Assignee(s): (std): NEUTRONIC DEV CORP
Assignee(s): NEUTRONIC DEVELOPMENT CORP

Title: Micro-image viewer

Abstract: Source: GB1022300A 1,022,300. Optical-projection apparatus. NATIONAL CASH REGISTER CO. Oct. 15,1964 [Dec. 11,1963], No. 42097/64. Heading G2J. In a micro-image viewer, heat is dissipated from a film 24, at the focus of a high intensity microscope illumination system, by suction induced, intimate contact with a glass object stage 22. The optically flat surface of stage 22 has a peripheral groove, underlying the margin of film 24, which is connected by duct 54 to suction pump 50. The microscope is raised bodily by means of a conventional coarse adjustment, on operating lever 37, to allow the film to be changed. On returning lever 37 to its previous position, it closes a switch which energizes suction pump motor 49. On setting up a vacuum in the groove and in ducts 54 and 99, a pressure transducer, connected to the latter, removes an obturator disc from the path of a light beam of a Xenon arc lamp 16. A loss of vacuum, indicating that thermal contact between film 24 and stage 22 has been broken, leads to immediate re-obturation of the light beam before the film is damaged by heat. The light passes normally through lens and diaphragm 18 and is reflected by mirror 20 to condenser lens system 21 which focuses the image of the diaphragm aperture in the object plane of microscope objective 26. The position of the object stage 22 is controlled by two handles, such as 85. These operate screw-threaded rods to move carriages 48 and 72 in mutually perpendicular directions, thus bringing the selected micro-image on film 24 in the projection position. A final image is received on ground glass plates 15a, b after reflection at 27, 28 and 29. Plate 15a has a continuous orbital motion imparted to it by motor 103 to eliminate scintillation.

Classifications:

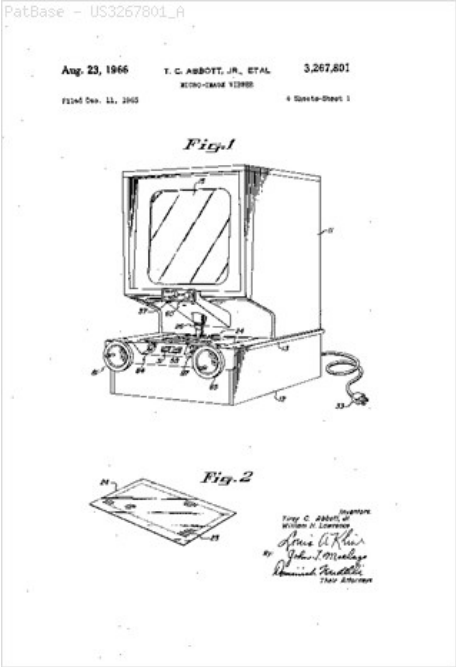
International (IPC 8-9): G03B21/10 G03B21/11 G03B21/16 (Advanced/Invention)

International (IPC 1-7): G03B21/11 G03B23/08 G03B27/32

CPC: G03B21/10 G03B21/11 G03B21/115 G03B21/16

European: G03B21/10 G03B21/11 G03B21/11C G03B21/16

US: 352/104 352/222 353/24 353/27R 353/39 353/55 353/60 353/75 353/78 353/85 353/88



Family:

Publication number	Publication date	Application number	Application date
BR6465001 A0	19730517	BR19640165001	19641203
GB1022300 A	19660309	GB19640042097	19641015
US3267801 A	19660823	US19630329743	19631211

Priority:

US19630329743 19631211

Assignee(s): (std): NCR CO

Assignee(s): THE NATIONAL CASH REGISTER COMPANY

Inventor(s): (std): ABBOTT JR TIREY C ; LAWRENCE WILLIAM H ; LAWRENCE W ; ABBOT F

Inventor(s): JR TIREY C ABBOTT

Title: Plant-manufactured building structure

Abstract: Source: GB1048639A 1,048,639. Prefabricated room units; foundations; roofs. RICHARDSON HOMES CORPORATION. Oct. 21, 1963 [March 1, 1963], No. 41416/63. Headings E1A, E1S and E1V. A frame truss for use in a prefabricated room unit consists of a horizontal, continuous floor joist, upstanding side columns 49 and a pair of roof truss arms 50 all rigidly interconnected. The trusses are spaced apart by T-section beams which are positioned in aligned holes in the trusses and releasably secured thereto by wedges, see Figs 35 and 36 (not shown). The joists of the trusses are of C-shaped crosssection and the floor joists thereof rest on foundation beams 46 which in turn are mounted on reinforced concrete footings, an earth connection extending from the floor joists to a **ground rod** through the reinforcements in the footings, see Figs. 29 and 30 (not shown). The ceiling panels are supported on the upturned lip of the arms 50 and are made of acoustic insulating material. Each roof section consists of a plywood panel covered by an insulation panel and an **aluminium** sheathing-adjacent flanged edges of which are interconnected by sealing caps, see Figs. 33... 39 (not shown). The room units are provided with furniture, fittings and finishes as desired. For details concerning expansion and other joints between various members, shapes and forms of sealing caps, materials employed and other details the Specification should be referred to.

Classifications:

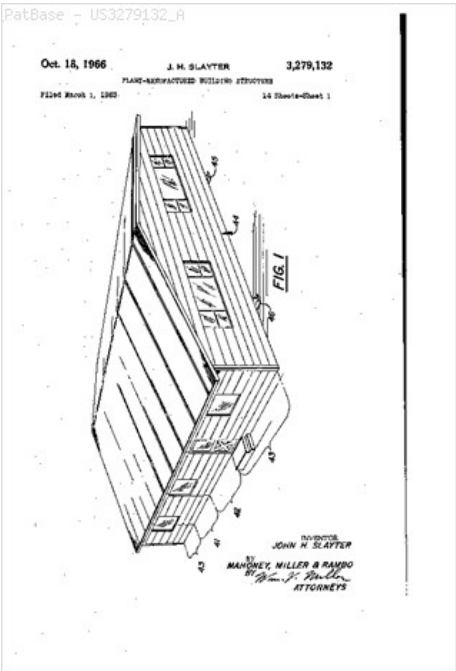
International (IPC 8-9): E04B1/00 E04B1/24 E04B1/348 (Advanced/Invention); E04B1/00 E04B1/24 E04B1/348 (Core/Invention)

International (IPC 1-7): E04B1/00 E04B1/02 E04B1/343 E04H15/04

CPC: E04B1/0007 E04B1/24 E04B1/348 E04B1/3483 E04B2001/2433 E04B2001/2445 E04B2001/2448 E04B2001/2463 E04B2001/2472 E04B2001/2481 E04B2001/2484 E04B2001/2487

European: E04B1/00B E04B1/24 E04B1/348 E04B1/348C3 P04B1/24B11 P04B1/24B22 P04B1/24B40 P04B1/24B52 P04B1/24C3 P04B1/24D P04B1/24E P04B1/24P

US: 52/238.1 52/299 52/467 52/470 52/643 52/73 52/79.7 52/79.9 52/93.1 D25/61



Family:

Publication number	Publication date	Application number	Application date
GB1048639 A	19661116	GB19630041416	19631021
US3279132 A	19661018	US19630262148	19630301

Priority:

US19630262148 19630301

Assignee(s): (std): RICHARDSON HOMES CORP

Inventor(s): (std): SLAYTER JOHN H