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R. J. FRANK

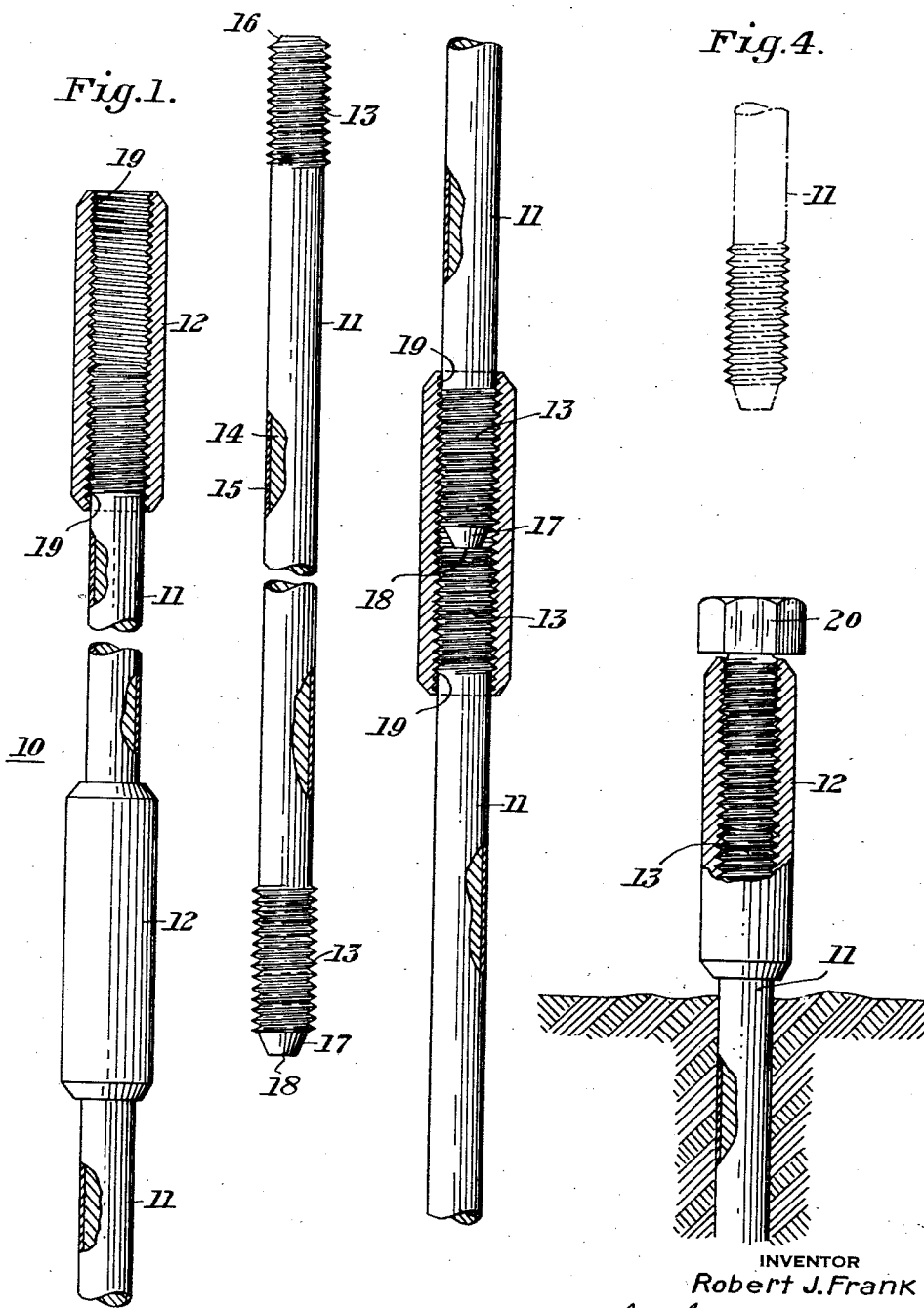
2,186,482

GROUND ROD

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Fig.2. Fig.3.

Fig.4.



INVENTOR

Robert J. Frank

by his attorneys

Stebbins, Bleske & Parsons

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GROUND ROD

Robert J. Frank, Pittsburgh, Pa., assignor to
Copperweld Steel Company, a corporation of
Pennsylvania

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1 Claim. (Cl. 174—7)

This invention relates to ground connections for electrical circuits, in the form of sectional rods adapted to be driven into the earth.

Sectional, driven ground rods have been known heretofore (Hamilton et al. Patent No. 1,756,641). Their chief advantage is that they can be driven by hand quite conveniently. The use of threaded joints between ground rod sections has recommended itself because such joints are cheap, easy to assemble, and capable of transmitting tension as well as compression. This last is very important in ground rods inasmuch as it is frequently necessary to withdraw a driven rod upon striking an obstruction, or on moving poles or towers supporting a transmission line. In spite of these characteristics, rods with threaded joints have not been used heretofore, so far as I am aware, because the ends of rod sections, if threaded in the ordinary manner, are easily damaged either by rough handling in shipment or by the impact of the tools used in driving the rod, and the threaded portions of ferrous rods rust very rapidly. To avoid these objections, other types of joints have been used in which the advantage of tension transmission has been largely sacrificed (Newpher Patent No. 2,111,799).

I have invented a novel form of sectional ground rod adapted to be driven in the earth, employing threaded joints of novel form, which overcomes the aforementioned objections to ground rods having threaded joints and, furthermore, provides a ground rod having other advantages over those known heretofore. In a preferred form, the invention comprises a plurality of sections of rod having threads of novel form at each end for cooperation with threaded sleeve couplings. The rod sections are preferably each composed of a steel core which provides sufficient rigidity for driving and a copper sheath to protect the core against corrosion. Further details of the invention will be referred to in the course of the following extended description and the novel features will be particularly pointed out in the appended claims. The accompanying drawing illustrates a preferred embodiment of the invention.

In the drawing:

Fig. 1 is a view partly in side elevation and partly in section showing a ground rod in the process of being driven;

Fig. 2 is an elevation of a rod section;

Fig. 3 is an axial section through a joint between sections; and

Fig. 4 is a diagrammatic view partly in section illustrating the operation of driving the rod.

Referring now in detail to the drawing, a ground rod 10 in accordance with the invention, comprises a plurality of sections 11 connected by coupling sleeves 12. The sections 11 may be of any convenient length and are threaded at opposite ends as shown at 13. The sections 11 are preferably composed of a steel core 14 enclosed within a copper sheath 15 welded thereto. The upper end of each section may be slightly chamfered as at 16 and the lower end provided with a blunt point 17 having a flat end 18. The threads 13 are formed by cold rolling and, therefore, have a crest diameter greater than the diameter of the unthreaded portion of the rod. The threads are formed only in the copper sheath and do not extend into the steel core, although the rolling of the threads slightly distorts the core. By rolling the threads I avoid materially reducing the sectional area of the rods at the threaded portion which would result if the threads were cut in the usual manner. The cold working effected in working the threads, furthermore, tends to harden and toughen them, increasing their resistance to injury.

The coupling sleeves 12 are preferably of bronze and are threaded throughout their length as shown. The ends of the sleeves are counterbored for a short distance inwardly thereof, as shown at 19, to cut off the threads to half their initial height. This permits the entire threaded portion of the sections 11 to enter the coupling sleeves when screwed home therein, and automatically positions the ends of the sections at the medial transverse plane through the sleeves. The latter results from the fact that the rod sections cannot be threaded into the sleeves beyond the point at which the end of the threaded portion of the rod engages the full thread in the sleeve.

The length of the portions of the sections 11 covered by the threads 13 bears a relation to the length of the sleeves 12 such that when two sections are screwed home within a coupling as shown in Fig. 3, the flat end 18 of the upper section will abut firmly against the chamfered end of the lower section. This causes the driving force applied to the upper section in the manner to be explained shortly, to be transmitted directly to the lower section. I thus avoid subjecting the threads to the impact of the hammer blows and protect them from any injury which might result from such impact.

Fig. 4 illustrates the manner of installing a rod according to the invention. A section 11 is first started into the ground with its blunt point 17 downward or a special starting section having an

unthreaded, sharp-pointed lower end may be used if desired. A sleeve 12 is threaded onto the first section 11 and a cap screw 20 threaded in the upper end thereof. The shank of the cap screw is long enough to permit it to abut against the upper end of the section 11 before its head seats on the end of the sleeve 12. The section 11 is then driven in to the ground level by a light sledge or a pneumatic hammer, the driving blows being delivered to the head of the screw 20. The screw is then removed and a second section 11 as indicated in chain lines in Fig. 4 is threaded into the sleeve 12 and screwed home tight as shown in Fig. 3. The cap screw 20 is threaded into the sleeve 12 at the upper end of the next section 11 and the driving operation continued with the addition of successive rod sections and sleeves until the desired depth has been attained.

The rod may also be installed by methods other than driving with a hammer, e. g., by screwing the rod into the ground after the attachment of a suitable boring tip to the lower end of the first section, connecting couplings and additional sections being added as the rod penetrates the earth. In this method of installation, the abutment of the ends of adjacent sections aids in transmitting the necessary torque from one section to the next section below.

It will be apparent from the foregoing description that the invention is characterized by numerous advantages and novel features compared to driven ground rods as known heretofore. In the first place, a highly durable ground connection is provided by virtue of the exterior sheath of copper which encloses the rod sections throughout their full length. The steel core, furthermore, permits the rod to be made in small diameters with sufficient rigidity to be driven easily in almost any type of soil. A rod section 8' long and $\frac{1}{2}$ " in nominal outside diameter can be driven readily without bending. This reduces to a minimum the loss involved in scrapping bent or deformed rods.

The copper sheath and steel core are permanently united by welding so there can be no corrosion or electrolysis therebetween. The copper sheath also gives the ground connection the desired high conductivity. There is likewise little or no chance of corrosion between the rod sections and the bronze couplings, which would increase the joint resistance. The end-to-end pressure between rod sections also maintains a good contact therebetween.

Because of the resistance of the steel core to deformation under repeated impact, little or no "mushrooming" of the upper end of a rod section occurs during driving. This makes it possible to slip a ground rod clamp over the end of a rod section after it has been driven, which is preferable to placing it thereon before driving.

The method of installing the rods as explained herein does not involve any mutilation of the threads on the rod sections or couplings. The impact necessary for driving the rod is transmitted directly from one rod section to the other so that the threads of previously driven sections are protected from injury. Other advantages of the invention have already been pointed out.

Although I have illustrated and described herein but a preferred form of the invention, it will be recognized that changes in the details of the invention as disclosed may be made without departing from the spirit of the invention or the scope of the appended claim.

I claim:

A ground rod including a cuprous sleeve having a cylindrical bore therein threaded internally, and a pair of rod sections each having a ferrous core and a cuprous sheath with threads at the end formed exclusively in the sheath, said ends being threaded into said sleeve until they abut whereby driving blows are transmitted directly from one rod section to the adjacent section.

ROBERT J. FRANK.