United States Patent [19]

Miller

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[54] **PULLING IRON**

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[52] **U.S. Cl.** **52/125**

[51] **Int. Cl.**[2] **E04H 13/00**

[58] **Field of Search** 52/125, 128, 142, 133, 52/124

[56] **References Cited**

UNITED STATES PATENTS

2,794,336	6/1957	Ballou	52/125 X
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Attorney, Agent, or Firm—Seidel, Gonda & Goldhammer

[57] **ABSTRACT**

A pulling iron adapted to be partially embedded in an underground vault has a loop of steel cable wherein the legs and bight portion of the loop are coated with a polymeric plastic material. Each leg has an extension disposed at an angle with respect thereto to facilitate connection thereof to rebars. The coating on each leg is integral in one piece with a mold plate extending across the loop.

11 Claims, 4 Drawing Figures

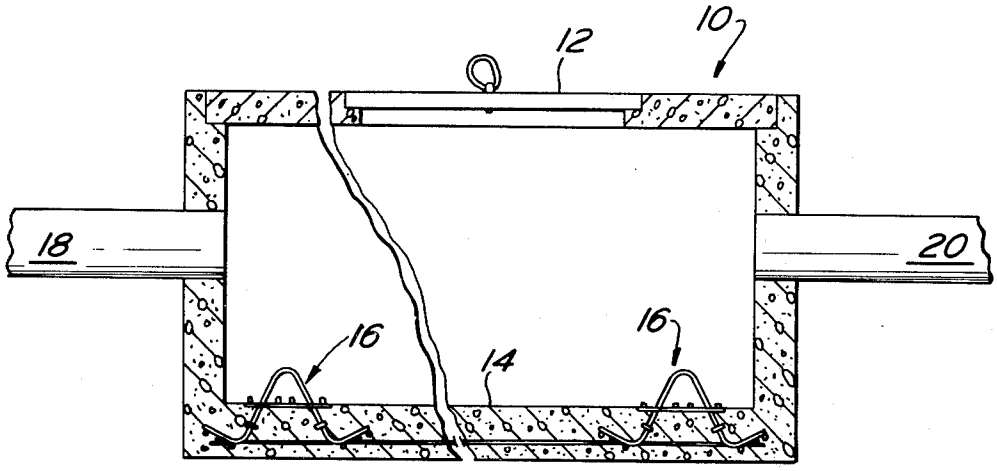


FIG. 1

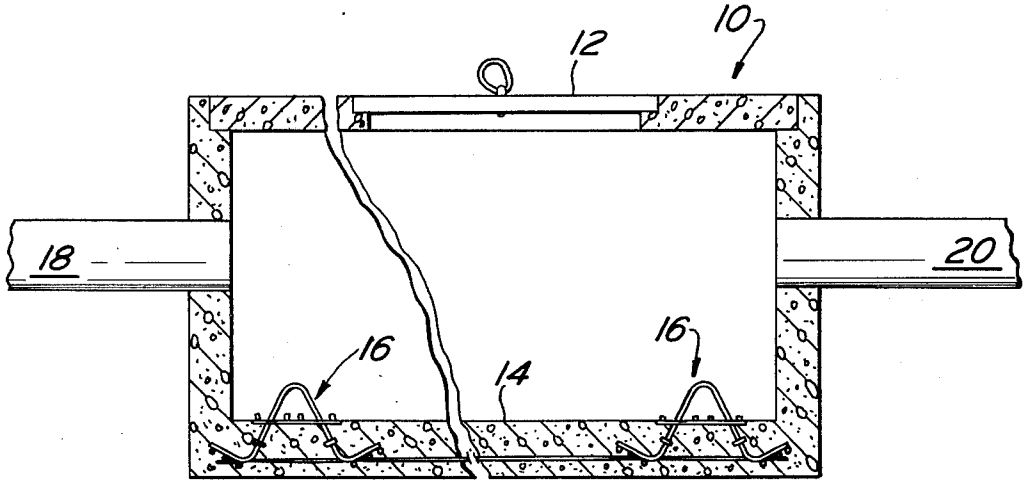


FIG. 2

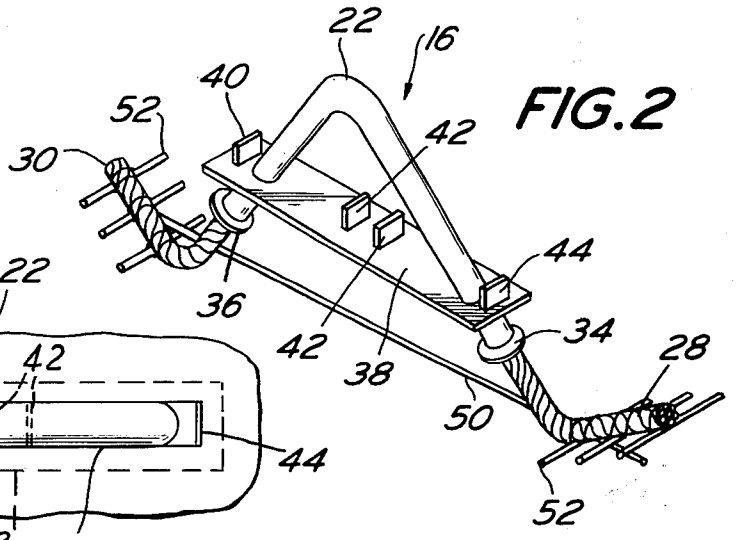


FIG. 4

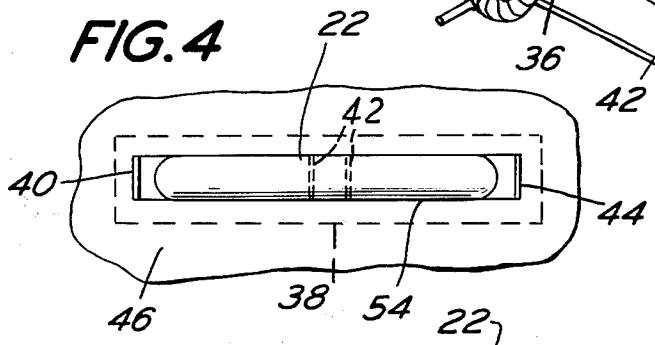
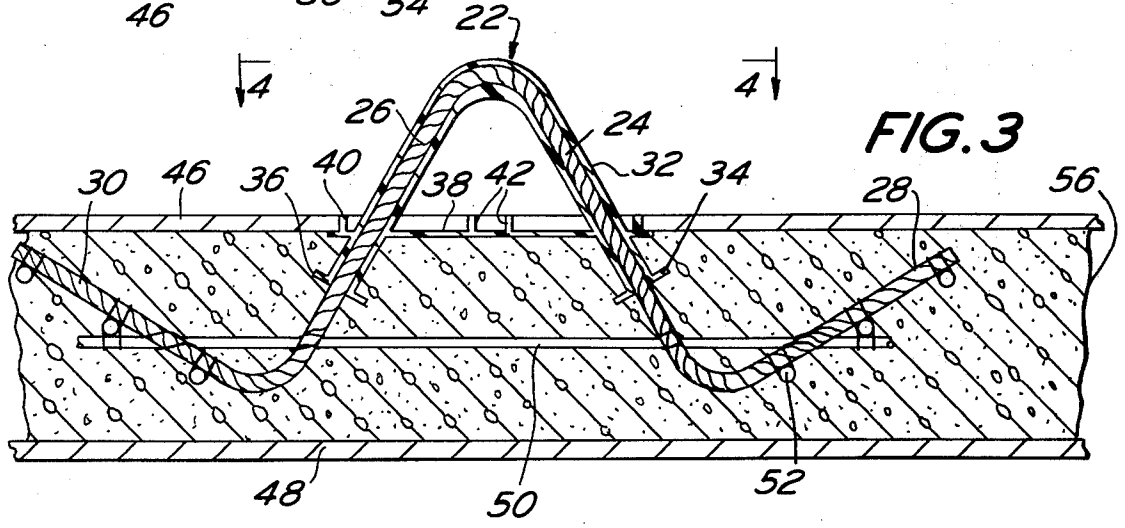


FIG. 3



PULLING IRON

BACKGROUND

Pulling irons are per se old in the art of concrete reinforced underground vaults. Such vaults are generally made of two or more pieces coupled together. See FIG. 6 of Pat. No. 3,263,378 wherein the pulling irons are located in or near the bottom wall of the vault. Wires to be joined within the vault are looped through the pulling irons.

Present pulling irons are usually zinc coated steel and weigh approximately 5 pounds. The zinc coating is easily damaged by hooks which engage the loop of the pulling irons and otherwise have a very limited lifetime. The underground vaults usually have water in them so that the pulling irons in an existing vault are usually rusty.

Use of the present pulling irons as described above requires a removeable plate on the steel forms used for casting the vault or components thereof. Before the concrete vault can be stripped from the forms, the plate must be removed.

The pulling iron of the present invention is adapted to be partially embedded in a wall of an underground vault such as the bottom wall thereof. The pulling iron is in the form of a loop of steel cable having legs extending from a bight portion. Each leg has an extension disposed at an angle with respect thereto to facilitate connection of the pulling iron to a rebar.

A polymeric plastic coating is provided on each leg so as to encase the bight portion and at least a part of the legs. The coating covers all portions of the pulling iron loop adapted to be exposed when the pulling iron is partially embedded in a wall of the underground vault.

In the preferred embodiment of the present invention, a surface plate is molded integrally with the coating on the legs of the loop and extends between the legs of the loop. The surface plate is of sufficient size so that it may overlie the slot in a metal casting form. The coated loop extends through the slot in the metal form while the surface plate overlies the entire slot in said form during casting of the vault. The surface plate is preferably provided with projections for properly aligning the plate with the slot in the casting form and to prevent the loop from tilting during casting of the vault.

It is an object of the present invention to provide a novel pulling iron which is stronger and less expensive than those utilized heretofore, while being lighter in weight and noncorrosive.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIG. 1 is a vertical sectional view through an underground vault.

FIG. 2 is a perspective view of a pulling iron in accordance with the present invention.

FIG. 3 is an enlarged detail view of steel forms in which the bottom wall of the vault shown in FIG. 1 is being cast.

FIG. 4 is a partial plan view taken along the line 4—4 in FIG. 3.

Referring to the drawing in detail, wherein like numerals indicate like elements, there is shown in FIG. 1

a concrete reinforced underground vault of a simplified construction having a manhole **12** to facilitate entry thereinto. The vault **10** includes a bottom wall **14** containing one or more of the pulling irons **16** partially embedded therein. A wire way or conduit **18** for wires communicates with the interior of the vault **10** through a vertical side wall thereof. If desired, another conduit **20** may communicate with another one of the side walls of the vault **10.** Wires to be joined within the vault **10** enter the same through the conduit **18** and/or **20.**

The pulling iron **16** is embedded in or near the bottom wall **14** of the vault **10.** The pulling iron **16** includes a bight portion **22** from which extends legs **24** and **26** of a steel cable. Leg **24** terminates in an angled extension **28** while leg **26** terminates in an angled extension **30.** The steel cable is preferably a rigid cable having seven or eight strands and which complies with ASTM Designation: A416–68 so as to have a minimum ultimate strength of 250,000 psi based on the nominal area of the strand. In a seven strand cable, there is a center wire enclosed tightly by six helically placed outer wires with a uniform pitch of not less than 12 and not more than 16 times the nominal diameter of the strand.

The bight portion **22** and any portion of the legs **24** and **26** adapted to be exposed when the pulling iron **16** is embedded in the vault **10,** are provided with a coating **32** of polymeric plastic material. It will be noted that the coating **32** is thicker on the inside of the bight portion **22.** Otherwise the coating **32** is of uniform thickness. I have found a suitable thickness for coating **32** to be one-eighth of an inch.

The coating **32** may be a wide variety of polymeric plastic materials which are hard, rigid, strong, tough and resilient, dimensionally stable under exposure to moisture and heat, resistant to chemicals, high strength, and which are a substantially non-hygroscopic (have a water absorption of less than 1%/24 hours). I prefer to use a highly crystalline acetal copolymer sold commercially under the trademark Celcon, having a water absorption of 0.41%/24 hours; tensile strength of 10,000 psi; elongation 15%; flexural strength 14,000 psi; and shear strength of 9,500 psi.

Due to the fact that the cable has an irregular surface, a nonrotatable coating **32** may be applied thereto with a good bond between the cable and the coating, The irregular surface of the cable also facilitates a good bond with the concrete in which it is to be embedded as described hereinafter.

The coating **32** terminates in radially outwardly directed flanges **34** and **36** on the legs **24** and **26** respectively. The flanges **34** and **36** act as barriers for any water or moisture which tends to follow the seam between the concrete and the coating **32.** The coating **32** on leg **24** is preferably integral in one piece with the coating **32** on the leg **26** by way of a surface plate **38.** Thus, coating **32** and plate **38** are molded onto the cable at the same time. Plate **38** is provided with a plurality of projections such as projections **40, 42** and **44.** The projections are integral with the plate and are spaced inwardly from the periphery of plate **38** as shown more clearly in FIG. **2.** The projections have a height of about ½ inch, a thickness of about one-eighth inch, and a width corresponding to the diameter of the coated loop as shown more clearly in FIG. **4.**

The components of the vault **10** are cast using metal casting forms including the inner form plate **46** and an outer plate form **48.** Before concrete **56** is poured into

the space between the form plates **46** and **48**, the loop of the pulling iron **16** is inserted through the slot **54** in the plate **46**. The plate **38** overlies the peripheral portion on the plate **46** around the slot **54**. The distance between projections **40** and **44** corresponds to the length of the slot so as to properly orientate the loop of the pulling iron with respect to the slot. Each of the projections **40–44** extends through the slot **54** and maintains the loop perpendicular to the plane of the plate **46**. The loop should not tilt during the introduction of concrete **56** into the space between the form plates **46, 48**.

The exposed portion of the legs **24, 26** and/or the extensions **28, 30** are rigidly connected to transverse rebars **50** and/or longitudinally extending rebars **52**. Hence, the pulling iron **16** is an integral part of the reinforcing steel for the vault **10**. The extensions **28** and **30** need not be angled upwardly in FIG. **4** but rather may extend horizontally in FIG. **4**.

It will be noted that there is no separate plate to be removed as part of the casting forms in order to accomodate the pulling iron **16**. When the form plates **46, 48** are stripped, the plate **38** remains as a part of the vault flush with the wall of the vault except for the projections **40–44** which may remain or may be removed with a grinder if desired.

While the above described polymeric plastic is preferred as the material for coating **32** and plate **38**, other thermoplastic materials capable of being injection molded may be used. For example, an acetal resin sold under the trademark DELRIN may be used. The coating **32** has a smooth outer periphery but its inner periphery enters the crevices between adjacent peripheral strands of the cable so as to be non-rotatable with respect to the cable.

Dimensions can vary depending on the size of the vault. The following are exemplary by way of example and not by way of limitation: the included angle between legs **24, 26** is 52°, the cable has a diameter of one-half inch, coating **32** is one-eighth inch except for the inner side of bight portion **22** which is one-fourth inch, plate **38** is 3/32 inch, the extensions **28, 30** are about 6 inches long and perpendicular to their respective legs, and plate **38** is connected to legs **24, 26** at their midpoint about 4 inches from bight portion **22**. The included angle between legs **24, 26** is usually 45°–65°.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

I claim:

1. A pulling iron adapted to be partially embedded in an underground vault comprising a loop of steel strand-type cable, said loop having legs extending from a bight portion, each leg having an extension disposed at an angle with respect thereto to facilitate connection thereof to rebars, said bight portion and at least a portion of each leg being encased in a coating of polymeric plastic material, said coating covering all portions of said loop adapted to be exposed when the loop is partially embedded in a wall of a vault, said coating being a tough plastic material which has substantially no absorption with respect to water and oil, said coating being non-rotatable with respect to said cable.

2. A pulling iron in accordance with claim **1** including a plate extending across said legs, said plate being integral in one piece with the coating on said legs at a location where the legs are adapted to emerge from a wall of a vault whereby the plate will be substantially flush with a wall of the vault, said plate being of the same material as said plastic material.

3. A pulling iron in accordance with claim **2** wherein said steel cable includes a center wire enclosed tightly by at least six helically placed outer wires and has a minimum ultimate strength of at least 250,000 psi.

4. A pulling iron in accordance with claim **2** including a plurality of projections on one surface of said plate, said projections extending away from said plate toward the bight portion of said loop.

5. A pulling iron in accordance with claim **2** wherein the coating on said legs terminates in a radially outwardly extending protuberance, said plate being connected to said coating between said bight portion and said protuberances.

6. A pulling iron in accordance with claim **1**, a concrete reinforced vault having a bottom wall, said pulling iron being embedded in said vault bottom wall, said loop and plate being exposed, said plate being substantially flush with the surface of said bottom wall.

7. A pulling iron comprising a loop of steel strand-type cable, said loop having legs extending from a bight portion, each leg having an extension disposed at an angle with respect thereto, a polymeric plastic coating on said bight portion and on at least a substantial portion of each leg, a plate-like member extending between said legs, said plate-like member being integral with and of the same material as said plastic coating, said plastic coating being a tough plastic material having a water absorbency of less than 1%/24 hours.

8. A pulling iron in accordance with claim **7** wherein said coating on said bight portion and legs extends into crevices between adjacent peripheral strands of said cable to render the coating non-rotatable with respect to said cable.

9. A pulling iron in accordance with claim **8** wherein said plastic coating on said bight portion and legs is of substantially uniform thickness except for the inner side of the bight portion which is thicker than the remainder of the coating.

10. A pulling iron comprising a loop of metal strand cable having a center wire enclosed tightly by a plurality of helically placed outer wires, said loop having a bight portion from which a pair of legs extends, each leg having an extension disposed at an angle with respect thereto, a polymeric plastic coating on said bight portion and extending along a portion of each leg, the remaining portion of each leg and each extension being free from any coating, said coating extending into crevices between adjacent peripheral strands of said cable so that the coating is non-rotatable with respect to the cable.

11. A pulling iron in accordance with claim **10** including a plate-like member integral with said coating and extending between said legs, said member being wider than the diameter of said coated loop.

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