June 27, 1961 J. M. FOLEY 2,990,160

WIRE PULLER

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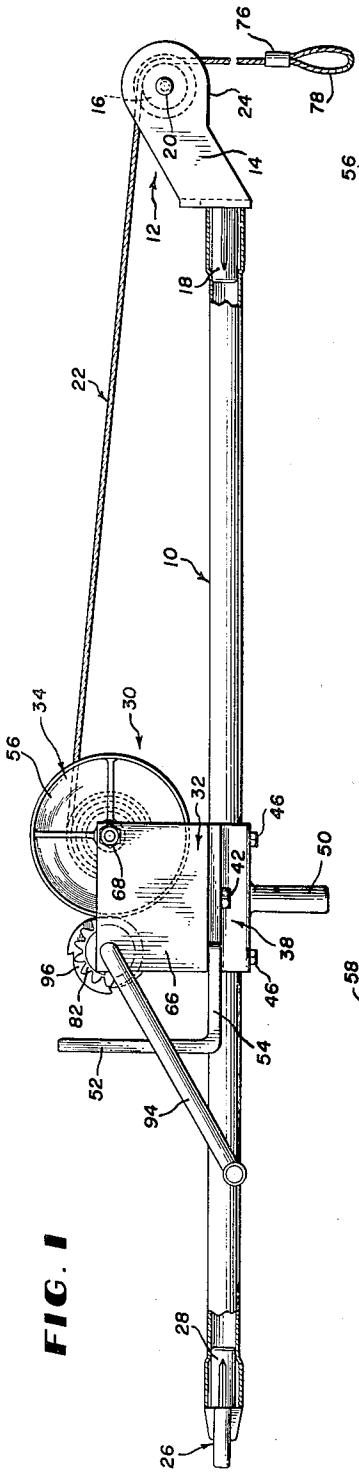


FIG. 1

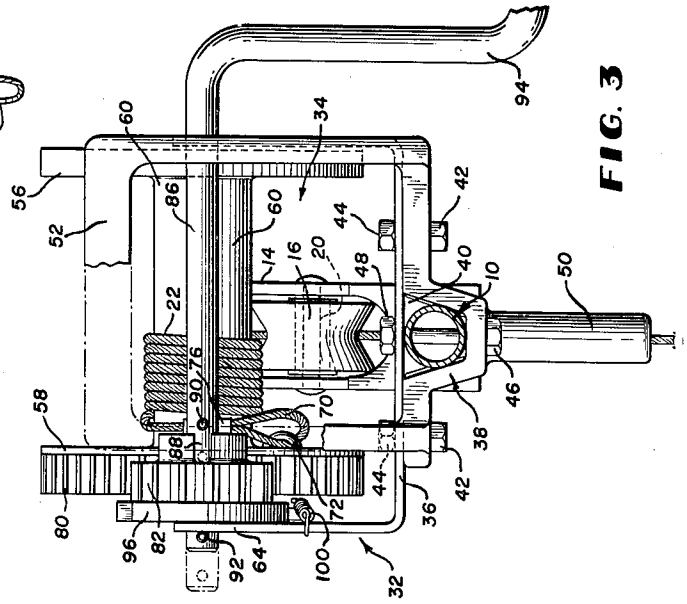


FIG. 3

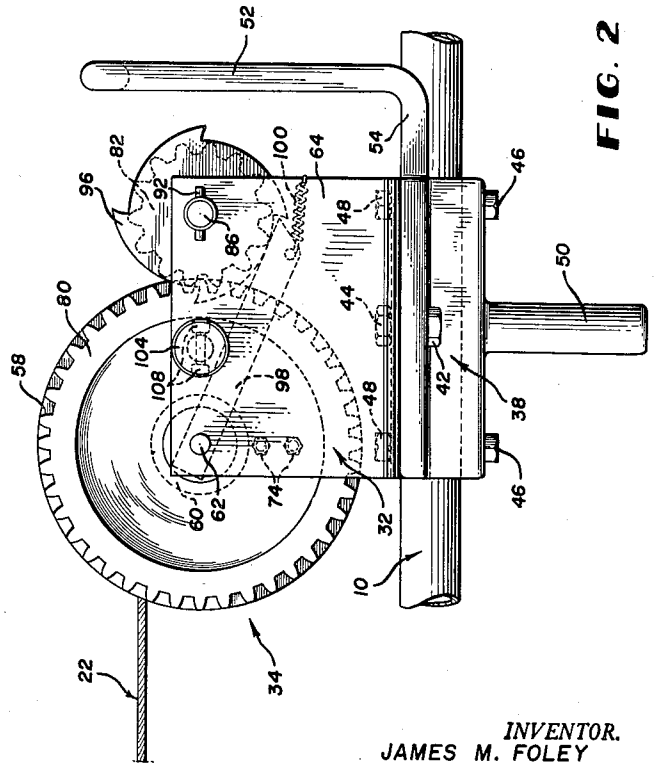


FIG. 2

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FIG. 4

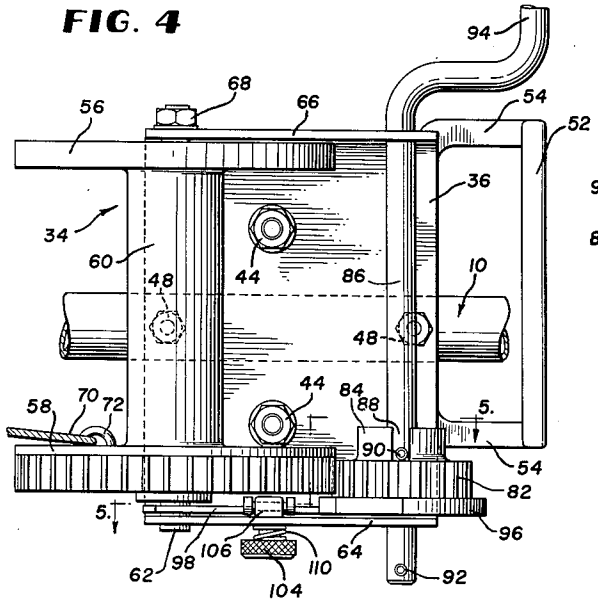
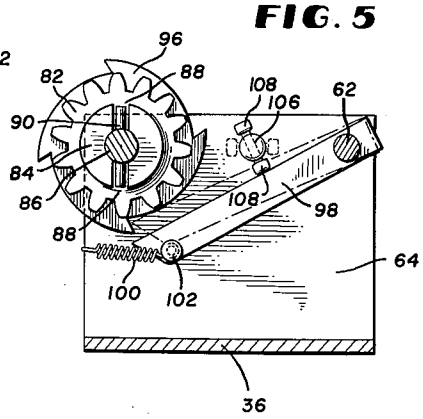


FIG. 5



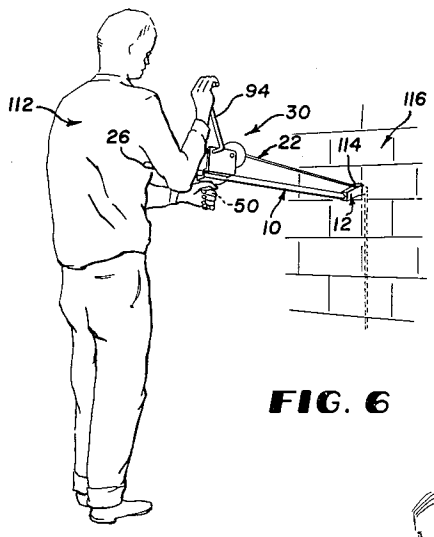


FIG. 6

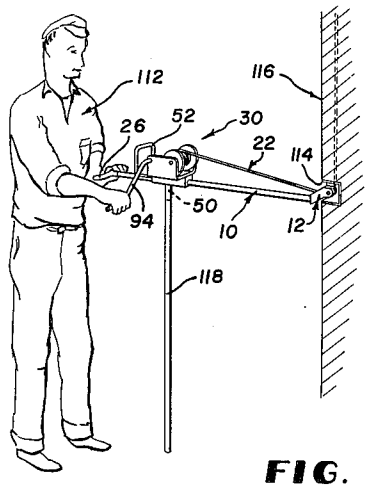


FIG. 7

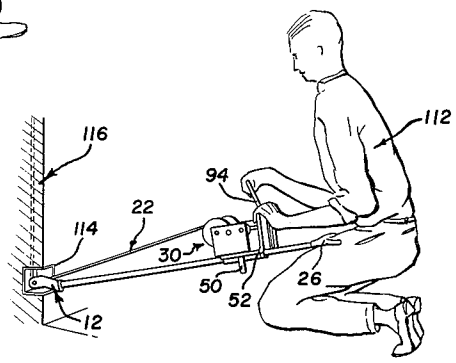


FIG. 8

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United States Patent Office 2,990,160 Patented June 27, 1961

2,990,160

WIRE PULLER

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Filed July 8, 1960, Ser. No. 41,629
4 Claims. (Cl. 254—134.3)

This invention relates to a wire puller and more particularly to a portable, manually operated device which may be employed by one man to pull wires through conduits or other wire passages.

The wire pulling devices now in general use may be separated into two categories, namely, simple fish tapes or snakes, and large power-driven winches. The present invention provides a wire puller which is much more efficient than the first category and which is much simpler and easier to use than the second category. It is accordingly a principal object of the invention to provide such a device.

Another object of the invention is to provide great pulling strength in a device which weighs very litle.

Another object of the invention is to provide a device of the foregoing type that is easy to use from an elevated position, as from an extension ladder or scaffold, where wire pulling with a snake is dangerous and difficult, and that may be employed safely to pull cables into live panels.

An additional object of the invention is to provide a device of the foregoing type which may be used to pull cables or wires into the smallest gem boxes, tile boxes, and the like.

Another object of the invention is to provide such a device which may be employed in close or confined quarters, where it is difficult or impossible to obtain leverage for pulling on a snake.

A further object of the invention is to provide a device to pull wires into finished or painted rooms without defacing walls or ceilings.

Still another object of the invention is to provide a device which permits long pulling runs without splicing.

An important feature of the invention is the ease with which it may be supported stably in different environments, without the expenditure of setting-up time and without the need for attachment to pipes, boxes, conduits, and the like.

Another feature of the invention is its adaptability to different types of installations, whether the pull required is upward, downward, or in another direction.

A further advantage of the invention is its stability to pull a large bundle of wires out of a conduit and to provide sufficient exposed wire length for splicing or terminal attachment.

Briefly stated, the device of the invention comprises an elongated frame having a pulley suitably mounted at one end, and a body rest handle at the other end. Located intermediately on the frame is a manually operated winch having a flexible cable which may be passed over or under the pulley. A handle is provided directly behind the winch to afford good stability and control as the winch is operated, and an additional handle below the winch is adapted for use with a prop for supporting the device. The construction of the pulley unit at the front of the frame permits its insertion directly into a terminal or outlet box or the like, provides support for the front of the device, and permits variation of the direction of pull.

The foregoing and other objects, advantages, and features of the invention and the manner in which the same are accomplished will become more readily apparent upon consideration of the following detailed description

of the invention taken in conjunction with the accompanying drawings, which illustrate a preferred and exemplary embodiment, and wherein:

FIGURE 1 is a side elevation view of the device of the invention;

FIGURE 2 is a fragmentary side elevation view illustrating a detail of the invention;

FIGURE 3 is a fragmentary rear view, partly sectional and broken away, illustrating a detail of the invention.

FIGURE 4 is a fragmentary plan view illustrating a detail of the invention;

FIGURE 5 is a sectional view taken along line 5—5 of FIGURE 4; and

FIGURES 6, 7, and 8 are perspective views illustrating typical applications of the invention.

Referring to the drawings, and initially to FIGURE 1 thereof, reference numeral **10** designates the frame of the device of the invention, which comprises a single length of hollow pipe, preferably cold-rolled tubing. At the forward end of the frame is a pulley unit **12** comprising a bracket in the form of a fork or yoke **14**, and a pulley **16**. The yoke **14** is generally U-shaped, having a splined stud **18** extending from its base. The stud **18** is press-fit into the forward end of the frame, expanding the frame somewhat, as shown and fixing the pulley unit to the frame securely. The arms of the pulley yoke are inclined upwardly from the base of the yoke as shown in FIGURE 1 and embrace the pulley therebetween. The pulley rotates on a spacer axle sleeve supported on a pin **20** which extends between the arms of the pulley yoke and which is flattened at its ends to prevent its removal from the yoke.

As shown in FIGURES 1 and 3, the pulley itself is located above the frame **10** so that a cable **22** may pass over the pulley, as in FIGURE 1, or under the pulley as will be described hereinafter. The pulley has a wide shallow face to permit the passage of a bundle of wires. As further shown in FIGURE 1, the pulley yoke **14** is augulated at **24** to form a stepped portion which may support the forward end of the wire puller with the pulley located above or below the end of a conduit, there being sufficient space between the edges of the yoke arms and the periphery of the pulley to insure that the pulley may rotate freely even when the pulley yoke is placed against extraneous objects.

At the rear end of the frame is a body rest handle **26** which is concave toward the rear and which has a splined stud **28** press-fit into the rear end of the frame in the same manner that the stud **18** is press-fit into the forward end.

Intermediate the ends of the frame is a manually operated winch **30**. The winch comprises a U-shaped or channel-shaped chassis or housing **32** which supports a winding drum **34**. As shown in FIGURE 3, the U-shaped housing **32** has a base portion **36** atop the frame **10** and substantially tangential thereto, and the bottom of the base is in face-to-face mating relation with a mounting bracket **38**. The mounting bracket has a depending channel **40** through which the frame **10** extends, and the channel preferably narrows downwardly and has splined side walls so as to grip the frame securely. The mounting bracket **38** and the base **36** of the winch housing thus form a clamp for the frame **10**, being held together by bolts **42** which extend through aligned bores in the bracket **38** and the base **36** and which receive nuts **44**. Additional bolts **46** may be passed upwardly through aligned bores in the bracket, the frame, and the base to receive nuts **48**. The mounting bracket **38** has a depending stub handle **50** below the winch which may be inserted in a pipe prop as will appear. A handle **52** of

inverted U-shape is located directly behind the winch as shown in FIGURES 2 and 3, extending from the mounting bracket on horizontal arms **54** and protruding above the winch for easy grasping by the operator. This handle insures stability when the winch is operated. The mounting bracket **38** and the handles **50** and **52** are preferably formed integrally, as from an annealed malleable casting.

As shown in FIGURE 4, the winding drum **34** has a pair of side discs **56** and **58** joined by a hub sleeve **60**. An axle **62** passes through the upright arms **64** and **66** of the winch housing and may have a head at one end and be threaded to receive a retaining nut **68** at the other end thereof. The cable **22** is formed with a loop **70** at one end thereof, as shown in FIGURE 3, and a U-bolt **72** passes through the loop and through the disc **58** to receive nuts **74** as shown in FIGURE 2. A suitable fitting **76** retains the loop **70**. The cable is wound upon the hub **60** of the drum in successive layers and extends from the drum to the pulley unit **12** as shown in FIGURE 1. The free end of the cable is provided with a loop **78** retained by another of the fittings **76**. The cable is stranded for strength and flexibility and is preferably a galvanized high carbon steel ⅛ inch aircraft cable formed of seven strands, each with 19 wires. The cable employed, while strong enough to permit innumerable pulls, is flexible enough to be drawn through conduits with the nylon line that is conveniently blown through conduits with compressed air. Such a cable has a rated strength of 2000 pounds, and in a practical embodiment 200 feet of such cable may be wound upon the winding drum.

One end of the winding drum has a spur gear **80**, preferably formed integrally with the disc **58**. The spur gear meshes with a pinion **82** mounted rearwardly of the winding drum as shown in FIGURE 4. The pinion has a hub **84** through which a drive shaft **86** passes with sufficient freedom to permit relative rotation between the pinion and the drive shaft. The hub is slotted as shown at **88**, and the drive shaft has a radial pin **90** which may extend into the slot as shown in FIGURE 4 to engage the hub and drive the pinion. The shaft **86** is mounted for rotation on the upwardly extending arms **64** and **66** of the winch housing and is also slidable transversely of the housing so as to disengage the pin **90** from the slots **88** as shown in FIGURE 3. Movement of the pinion along shaft **86** is limited by engagement of the lateral surface of the gear teeth with disc **58**. A stop pin **92** extends radially from one end of the shaft **86** to prevent complete removal of the shaft. The other end of the shaft is formed with a crank **94**. It is thus apparent that when the shaft **86** is in the position shown in FIGURE 4, the crank **94** may be turned to drive gears **82** and **80** and the winding drum **34**, and that when the shaft is in the position shown in FIGURE 3, the winding drum and the gears **80** and **82** may turn without turning the handle **94**.

In order that the cable **22** may be kept from unwinding, a ratchet mechanism comprising a ratchet wheel **96** and a pawl **98** is provided. The ratchet wheel is preferably formed integrally with the pinion **82** and lies between the pinion and the arm **64** of the winch housing. The pawl **98** may be pivoted on the axle **62** of the winding drum as shown in FIGURES 2, 4, and 5. The free end of the pawl is normally held engaged with the teeth of the ratchet wheel by a tension spring **100** having one end fixed to a pin **102** on the pawl and the other end looped about the edge of the housing arm **64** as shown in FIGURE 3. The pawl may be disengaged from the ratchet wheel by turning a knob **104** (FIG. 4) fixed to a stub shaft **106** carrying abutments **108** which may engage the pawl as shown in FIGURE 5. A small spring **110** may be inserted between the knob **104** and arm **64** of the housing to introduce some resistance to movement of the knob. When the pawl is engaged with the ratchet wheel, the cable may be wound onto the drum, but not off. When the pawl is disengaged and the crank **94** is disengaged from pinion **82**, the cable may be unwound freely.

By virtue of the construction of the device of the invention a very strong pull may be conveniently exerted by one man. All of the parts of the device are constructed for lightness as well as strength. In a practical embodiment of the invention, the device weighs only 26 pounds, and thus is fully portable. Yet the device will exert a pull of 1500 pounds with little exertion on the part of the operator, and over runs of up to 200 feet. Typically, the winch gear ratio is 3-to-1, and the mechanical advantage of the crank is 5-to-1, giving a total mechanical advantage of 15-to-1, but higher mechanical advantages may be obtained, as through the use of double reduction gearing.

FIGURES 6, 7, and 8 illustrate typical applications of the invention. In FIGURE 6 the left hand of the operator **112** grips the handle **50**, while the right hand drives the crank **94**. The forward end of the wire puller is inserted in a small outlet box **114** in a wall **116**, being supported in the box by the pulley unit **12**. As shown, the cable **22** extends over the pulley and then downward through the wall **116** in a conduit or other wire passage. By virtue of the construction of the pulley unit, the wire puller is supported at its forward end without attachment to the box **114**, thereby eliminating any setting-up time. Moreover, the pulley turns within the outlet box and is located to prevent damage to adjacent finished areas.

FIGURE 7 illustrates an application in which it is necessary to pull downward. Here the cable **22** is passed under the pulley of the pulley unit **12** and then extends upward through the wall **116**. In this application of the invention, the handle **50** has been inserted in one end of a length of pipe **118** which serves to support the wire puller on the floor, additional support being provided by the pulley unit **12** at the forward end as desired. The operator **112** grips handle **26** with one hand and turns the crank **94** with the other.

In the application illustrated in FIGURE 8, the wire puller is again supported at its forward end by the pulley unit **12** in the box **114**, the rear of the pulley being supported on the leg of the operator **112** by the body rest **26**. The operator grips the handle **52** with one hand and turns the crank **94** with the other.

As can be readily appreciated from the examples of FIGURES 6, 7, and 8, the device of the invention may be employed to pull all types of wire into any type of box. Since the wire is under complete control at all times, the device may be employed to pull wire in "hot" areas. Moreover, because of the compactness and lightness of the device, it may be readily employed in confined areas, where its inherent great leverage is especially advantageous. The elongated frame construction provides space between the winch and the pulley to permit drawing out lengths of wire for splicing or termination. In addition, for special applications, the bolts **46** may be removed and the bolts **42** loosened to permit the frame **10** to be moved relative to the winch for adjustment of the position of the winch on the frame or for adjustment of the inclination of the pulley to any desired angle; the bolts **42** may then be tightened to clamp the frame.

While a preferred embodiment of the invention has been shown and described, it will be apparent to those skilled in the art that changes can be made without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims. Accordingly, the foregoing embodiment is to be considered illustrative, rather than restrictive of the invention, and those modifications which come within the meaning and range of equivalency of the claims are to be included therein.

The invention claimed is:

1. A portable wire-pulling device comprising an elongated frame having a forward end and a rear end, a cable winding drum mounted on said frame and spaced a sub-

stantial distance from the forward end of the frame, said frame having support means rigidly fixed to its forward end for supporting said forward end in an outlet box and the like without attachment thereto, cable guide means mounted on said support means, said support means extending beyond the limits of said guide means in all directions from which wire is to be pulled to shield said guide means from contact with said outlet box and the like, a cable wound about said drum and extending past said guide means, said guide means having a guiding channel substantially wider than the width of the cable to permit the passage of a bundle of wires, and a handle mounted on said frame and extending transversely therefrom.

2. A portable wire-pulling device comprising an elongated frame having a forward end and a rear end, support means rigidly fixed to the forward end of said frame for supporting said forward end in an outlet box and the like without attachment thereto, a transverse body rest mounted at the rear end of said frame, a cable winding drum mounted on said frame at one side thereof intermediate and spaced a substantial distance from the ends thereof, a pulley rotatably mounted on said support means at the same side of said frame as said winding drum, said support means extending beyond the periphery of said

pulley in all directions from which wire is to be pulled to shield said pulley from contact with said outlet box and the like, and a cable wound about said drum and extending past said pulley, there being a clear cable path from the top of said pulley to said drum and from the bottom of said pulley to said drum, whereby the cable may be trained over or under said pulley as desired.

3. The device of claim 2, said support means comprising a bracket extending obliquely upward at the forward end of said frame, said pulley being carried by said bracket above said frame, and said bracket having a rest surface below said pulley for supporting said pulley above a conduit.

4. The device of claim 2, said device having a handle mounted on said frame adjacent said winding drum.

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