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LINE PULLER

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The present invention relates generally to the field of hand tools, and more particularly to a device for removably gripping an elongate member to permit the same to be pulled toward the user or pushed away therefrom.

In the handling of certain electrical equipment, for example, it is frequently necessary to draw a number of insulated wires disposed in side-by-side relationship through an elongate passage such as a conduit. This operation is normally performed by first pushing a resilient metal tape which also possesses substantial stiffness, into the empty conduit until an end portion of the tape projects from the opposite end thereof. The wire or lines that are to be pulled through the conduit are then removably connected to the projecting end portion of the tape whereby the tape, together with the wires joined thereto, may thereafter be forcibly drawn completely through the conduit sufficiently for the end portions of the wires to project from the conduit and can be disconnected from the tape.

Frequently in pulling the tape through conduit, particularly if sharp turns are formed therein, the tape will frictionally bind with the interior surfaces of the conduit and it is necessary to periodically exert a push-pull action on the tape to facilitate further advancement thereof toward the user. In the past, numerous gripping devices have been devised and used to removably grip one end portion of a tape to exert a pulling force thereon, but heretofore such devices have been incapable of transferring a pushing force to a tape, wire or other elongate member.

A major object of the present invention is to provide a hand-operated gripping device which is compact, light in weight, and easily portable, by means of which either a pulling or pushing force may be exerted on an elongate member.

Another object of the invention is to provide a hand-operated gripping device of relatively simple mechanical structure which requires little or no maintenance attention, and due to its low production cost, can be retailed at a price to encourage widespread use thereof.

These and other objects and advantages of the invention will become apparent from the following description of a preferred form thereof, and from the accompanying drawing illustrating that form in which:

FIGURE 1 is a side elevational view of the line puller shown gripping a tape, with the device being so held that it can be subjected to either a pulling or pushing force by means thereof;

FIGURE 2 is a side elevational view of the line puller in a disengaged position;

FIGURE 3 is a side elevational view of the invention showing the side opposite thereof from that shown in FIGURE 2;

FIGURE 4 is a vertical cross-sectional view of the device taken on line 4-4 of FIGURE 2;

FIGURE 5 is a vertical cross-sectional view of the device taken on line 5-5 of FIGURE 2;

FIGURE 6 is a fragmentary vertical cross-sectional view of the invention taken on line 6-6 of FIGURE 4; and

FIGURE 7 is a fragmentary horizontal cross-sectional view of the line puller taken on line 7-7 of FIGURE 6.

With further reference to the drawing for the general arrangement of the invention, it will be seen in FIGURES

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1 to 4 inclusive to include a rigid frame A that may be gripped by a hand B, as shown in phantom line in FIGURE 1. The lower forward edge portion of frame A (FIGURE 2) pivotally supports an elongate first tape-gripping member C. A second tape-gripping member D is pivotally supported from the upper forward end portion of frame A, and is also pivotally connected at E to an extension F which projects upwardly from the first gripping member C, as may best be seen in FIGURE 3.

A handle G extends rearwardly from the upper end portion of the second gripping member D, and a transversely disposed extension H is provided on the rear end of the handle that may be removably engaged by the thumb, as shown in FIGURE 1. An elongate recess J is formed in the frame A (FIGURES 1 and 2) which is in a longitudinal alignment with a space K defined between the inwardly disposed end faces of the first and second gripping members C and D respectively, when the invention is in the position shown in FIGURE 2.

A tape, wire or other elongate member L may be inserted in space K and through recess J when the line puller is disposed as shown in FIGURE 2, and tape L is longitudinally movable in space K and recess J so long as the line puller remains in this first position. However, when the handle G is pivoted downwardly in a clockwise direction, the gripping members C and D are pivoted in opposite directions with the tape L being frictionally gripped by the adjoining faces thereof, whereby either a pulling or pushing force can be exerted on the tape.

A spring M is mounted on the invention as shown in FIGURE 2, which is at all times under compression, and tends to pivot the handle G in a counter-clockwise direction to hold the gripping members C and D in first positions as shown, unless a manually applied force is exerted on the handle. The first and second gripping members C and D are so pivotally mounted on frame A, and the adjoining faces of these gripping members are so shaped that after the adjoining faces are brought into frictional contact with the tape L as shown in FIGURE 1, and a pulling force is exerted on the invention to move it away from a conduit N, also shown in FIGURE 1, with the first gripping member C tending to pivot in a clockwise direction and the second gripping member D in a counter-clockwise direction.

This tendency of the first and second gripping members C and D to pivot in opposing directions tends to move the adjoining faces thereof closer together. Consequently, the greater the pull on tape L, the greater will be the force with which the first and second members frictionally engage the exterior surface of the tape. Pulling of the tape L through the conduit N, as well as any wire or other elongate member O connected to the tape, may be accomplished without the exertion of any manual force on the handle G by the hand B after initial frictional contact between the tape and gripping members C and D is effected. However, if it is desired to push the tape L inwardly into the conduit N, a downward force must be exerted on the handle G to maintain the gripping members C and D in frictional engagement with tape L.

In detail, the frame A is defined by a lower first arm 10 and an upper second arm 12 which is parallel thereto. The rear ends of arms 10 and 12 merge into a vertically disposed crosspiece 14 in which the recess J is formed at substantially the center thereof. A reinforcing member P is situated within the confines of the two arms 10 and 12, and the crosspiece 14. Reinforcing member P has a first leg 16 that extends upwardly from the interior surface of the arm 10 (FIGURE 1), a second leg 18 that extends downwardly from the interior surface of arm 12 to merge with the first leg at substantially the center of the invention, and a third leg 20 which extends

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rearwardly from the junction of the first and second legs 16 and 18 respectively to merge with the forwardly disposed portion of the crosspiece 14. Leg 20 is in longitudinal alignment with the recess J and space K formed between the adjacent faces of the first and second gripping members C and D respectively.

Legs 10 and 12, crosspiece 14, as well as the reinforcing member P are preferably formed as an integral unit from a rigid material such as aluminum, steel, or the like. The forwardly disposed part of first arm 10 is bifurcated, and includes two parallel, laterally separated portions 10a and 10b having a space 10c therebetween in which the lower end portion of the first gripping member C may be movably disposed. Transversely alignable bores are forced in leg portions 10a, 10b and the lower part of gripping member C. A pin 22 extends through these bores to pivotally support the first gripping member C, as may best be seen in FIGURES, 1, 2 and 4.

The second arm 12 also has a bifurcated end portion defined by two parallel, laterally separated portions 12a and 12b which are separated by a rearwardly extending space 12c. The second gripping member D, and the arm portions 12a and 12b have transversely alignable bores formed therein through which a pin 24 extends to pivotally support member D from the arm 12 when it is disposed within the confines of space 12c, as shown in FIGURE 4. Gripping member C (FIGURE 3) is of slightly tapered configuration, with the widest portion thereof being on the upwardly disposed end thereof.

The upper extremity of the first gripping member C is defined by a curved face 23, the major portion of which slopes downwardly and forwardly away from the crosspiece 14 when the invention is in the position shown in FIGURE 2. The upper end of member C is preferably of thicker crosssection than the balance thereof, which may be easily effected by affixing a plate 26 thereto as shown in FIGURES 2 and 4, or if desired, by forming the gripping member C and plate 26 as an integral unit, such as by casting from metal or the like. As mentioned hereinabove and shown in FIGURE 3, an extension F is rigidly connected to gripping member C, and this extension projects upwardly from the first gripping member on the side thereof opposite that on which the plate 26 is mounted. The lower end of second gripping member D also has a curved face 28, but the major portion of this face 28 slopes upwardly and rearwardly toward the crosspiece 14 when the invention is in the position shown in FIGURE 2.

The lower end of the second gripping member D is preferably thickened by affixing a plate 30 thereto on the side thereof opposite that which is in abutting contact with the extension F, as shown in FIGURE 4. The lower surface of plate 30 is also curved and conforms to the curvature of the lower face 28 of the second gripping member D, as best seen in FIGURES 2 and 4. The pivotal connection E previously mentioned and shown in FIGURE 1, is effected by a rivet 32 that extends through transversely aligned bores formed in plate 30, member D, and the upper part of extension F, as may be seen in FIGURE 4.

The compressed spring M (FIGURES 1 and 4) is preferably helical, with the lower end portion thereof being seated in a downwardly extending recess 34 formed in the upper forward portion of the second arm 12. Spring M is sufficiently stiff that it will at all times remain in vertical alignment with the handle G and be in abutting pressure contact with the forward lower face of the handle. The forward face of the crosspiece 14 is subdivided into a number of curved surfaces 14a, 14b, 14c and 14d which may be engaged by the fingers of the hand B, as shown in FIGURE 3.

Operation of the invention is extremely simple. The device is normally disposed in the position shown in FIGURE 2 and gripped by the hand B. The tape L to be pulled through the conduit N, or other confined space, is

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inserted through the space K and recess J to occupy the position shown in FIGURE 1. Thereafter the handle G is rotated in a clockwise direction to bring faces 23 and 28 of the gripping members C and D into pressure contact with opposite sides of tape L.

Due to this pressure contact and a force exerted on the invention in a direction away from the conduit N, the first and second gripping members tend to rotate in opposite directions, with the faces 23 and 28 thereof pressure-gripping the exterior surfaces of the tape L to permit it to be pulled as previously described. After frictional engagement has been effected between the surfaces 24 and 28 and the tape L, no further force need be exerted on the handle G, for inasmuch as the first and second gripping members C and D tend to pivot in opposite directions, the space K therebetween becomes narrower, and the force exerted by the gripping members on the tape increases in proportion to the force exerted on the invention as it moves away from the conduit N.

However, if it is desired to exert a pushing force on the tape L, such a force tends to pivot the gripping members C and D in directions to return the gripping members from the positions shown in FIGURE 1 to that shown in FIGURE 2. Accordingly, to prevent this pivotal movement and to increase the space K between the gripping members C and D as a pushing is exerted on the tape L, a downward force must be exerted on handle G by the hand B. The position of the invention when a pushing force is being exerted on the tape L is shown in FIGURE 1.

The compressed spring M, best seen in FIGURE 6, at all times tends to expand and thereby maintains the handle G in the position shown in FIGURE 2, with the first and second gripping members C and D being so positioned that the width of space K will be such that a tape L of the maximum thickness that will be engaged can be easily inserted in space K and extended rearwardly through the recess J as shown in FIGURE 3. The purpose of thickening of the ends of the first and second gripping members C and D by use of the plates 24 and 30 or other means is to assure maximum frictional contact between the gripping members and opposite sides of the tape L. The combined thickness of gripping member C and plate 26, as well as the combined thickness of gripping member D and plate 30, is preferably greater than the width of the tape L that is to be gripped by the invention.

Although the invention is fully capable of achieving the objects and providing the advantages hereinbefore mentioned, it is to be understood that it is merely illustrative of the presently preferred embodiment thereof and I do not mean to be limited to the details of construction herein shown and described, other than as defined in the appended claims.

I claim:

1. A portable device adapted to be grasped by the fingers of a user's hand to frictionally contact parallel opposing sides of an elongate member to permit exertion of either a pulling or pushing force thereon, including: a flat rigid frame having at least one opening formed in the rear portion thereof for permitting said frame to be grasped by said fingers; first and second gripping members having adjacently disposed curved ends that can frictionally contact said opposing sides of said member; first means for pivotally supporting said gripping members on the forward portion of said frame in such positions thereon that said curved ends are separated from one another by a distance greater than the thickness of the thickest of said members which will be pulled or pushed by said device; a rigid extension affixed to said first gripping member and which extends therefrom to cover at least a part of one surface of said second gripping member; second means for pivotally connecting said extension to said second gripping member; spring means which at all times maintain said first and second grip-

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ing members in a first position wherein said curved ends are separated; and means operable by the thumb of said hand that is gripping said device for concurrently pivoting said first gripping member counterclockwise and said second gripping member clockwise to a second position wherein said curved ends frictionally contact opposing sides of said member to be pulled, which gripping members thereafter remain in said frictional contact with said elongate member without further use of said thumb-operated means so long as said device is moved by said hand in a first direction parallel to said elongate member to exert a pulling action thereon, said gripping members when said thumb-operated means is not in use being disengaged from said frictional contact with said elongate member by movement of said device relative thereto in a second direction opposite from that of said first direction, with said gripping members being adapted to be held in said second positions to permit a pushing action to be exerted on said elongate member in said second direction by movement of said device in said second direction during actuation of said thumb-operated means.

2. A portable device as defined in claim 1 wherein said thumb operable means is a handle that projects from one of said gripping members and can be engaged by the thumb when said crosspiece is gripped by said user's fingers.

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3. A portable device as defined in claim 1 wherein a transversely disposed slot is formed in said frame, which slot is aligned with said space between said curved ends and is capable of receiving a second section of said elongate member therein.

4. A device as defined in claim 1 wherein said spring means is a compressed helical spring having one end portion thereof disposed in a recess formed in said frame and an opposite end portion that contacts said handle.

5. A device as defined in claim 1 wherein the portions of said first and second gripping members defining said curved ends are at least as thick as the maximum width of elongate members to be gripped by said device.

6. A device as defined in claim 1 wherein said second means is a rivet that extends through transversely aligned bores formed in said extension and second gripping member.

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