April 3, 1956 D. L. KELLEMS 2,740,178

CABLE LUFFING GRIPS

Filed May 26, 1951

FIG.1.

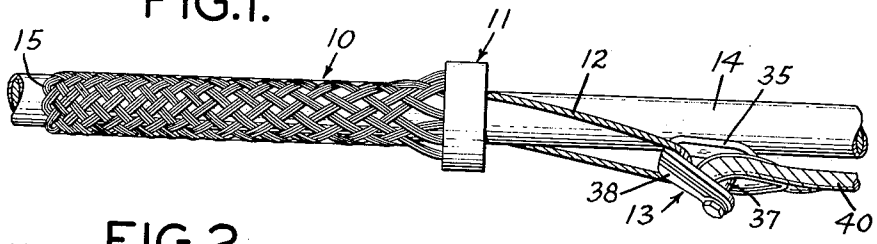


FIG.2.

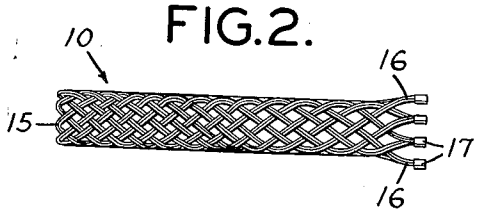


FIG.3.

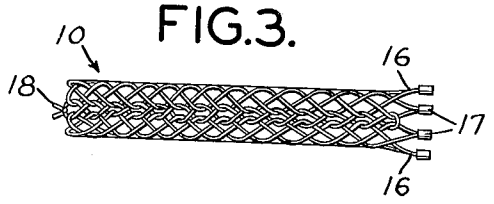


FIG.4.

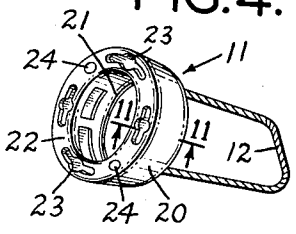


FIG.5.

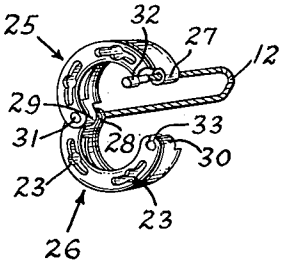


FIG.6.

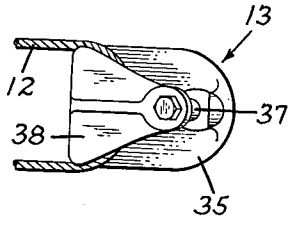


FIG.8.

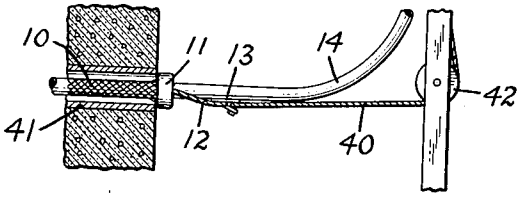


FIG.7.

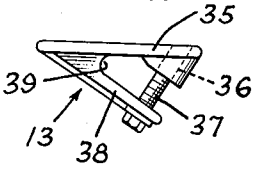


FIG.10.

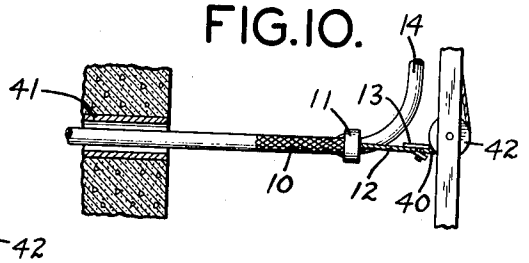
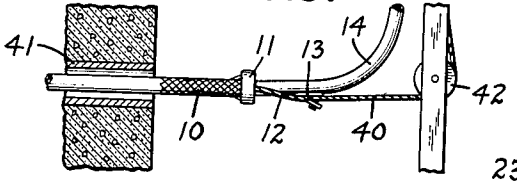


FIG.9.



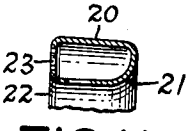


FIG.11.

INVENTOR.
DAVID L. KELLEMS
BY Klein & Hart
ATTORNEYS.

United States Patent Office

2,740,178

Patented Apr. 3, 1956

2,740,178

CABLE LUFFING GRIPS

David L. Kellems, Masons Island, Mystic, Conn., assignor to Kellems Company, Stonington, Conn., a partnership consisting of Vivien Kellems and David L. Kellems

Application May 26, 1951, Serial No. 228,450

12 Claims. (Cl. 24—123)

This invention relates to braided open mesh wire cable grips and more particularly to the type commonly referred to as slack pulling or luffing grips.

Grips of the indicated type are primarily utilized for removing slack in a cable or for removing cables from conduits. In the past, luffing grips have been made with an offset eye, that is, with the loop or draw rope at the draft end of the grip offset from the central axis of the grip. This arrangement obviously results in an uneven load being placed upon the individual wires that comprise the open mesh body of the grip during a pulling operation. This load may be described as eccentric. When such a strain is placed upon the grip, some of the strands of the mesh near the loop, being more heavily loaded than the others, have a tendency to cut sharply into the outer sheath or jacket of the cable. In practice, it has usually been found necessary to insert some sort of protective sleeve between the cable and the grip opposite to the loop to prevent such damage to the cable. A further disadvantage of prior type offset loop or eye slack grips, is that since in their use, some of the strands will be more heavily loaded than others, the full strength of all of the wires in such grips cannot be properly utilized.

The primary purpose of the present invention is to provide an improved luffing or slack grip which will have none of the aforesaid disadvantages, will take the applied load evenly and will utilize the full strength of all of its wires when in use.

A further object of the invention is to provide an improved luffing or slack grip which is more easily handled by and is safer for the operator than prior known grips of this type, and which is more versatile in its application than such prior grips.

Other objects of the invention as well as its advantages and features of novelty will become apparent after a perusal of the following description when read in connection with the accompanying drawings, in which Fig. 1 is a side view of a luffing unit constructed in accordance with the invention and illustrates its method of use; Fig. 2 is a side view of one form of the grip or mesh portion which may be used with the unit shown in Fig. 1; Fig. 3 is a view similar to Fig. 2 illustrating another type of mesh that may be used; Fig. 4 is a perspective view of the ring and sling portion of the unit shown in Fig. 1; Fig. 5 is a view similar to Fig. 4, but showing a split type of ring and its associated sling; Fig. 6 is a plan view of the yoke portion of the device shown in Fig. 1; Fig. 7 is a side elevation of the yoke shown in Fig. 6; Figs. 8, 9 and 10 are diagrammatic views, partly in section, illustrating various steps in the use of the device for removing or pulling slack in a cable, and Fig. 11 is a sectional view taken along the line 11—11 of Fig. 4 and on an enlarged scale.

In the drawings, the reference numeral 10 indicates

generally, the body or mesh of the grip in the several views. The body 10 of the grip is composed of a plurality of wire strands interlocked or interwoven to form an open mesh structure adapted to be placed in surrounding gripping relation with an article and having any suitable form. For example, the mesh structure may be completely tubular as shown in Figs. 1 and 2 of the drawings, or may be split longitudinally and adapted to be closed either permanently or temporarily by the use of a flexible lacing of any suitable material, as shown in Fig. 3. The various types of closed and split grips are well known in the art and examples of the same are shown in Patent No. 1,769,479 issued to S. E. Whaley, July 1, 1930, and Patent No. 2,017,625 issued to E. E. Kellems, October 15, 1935.

The grip body 10 forms one unit of the slack pulling device of this invention, the other units comprising a ring 11 with a rope sling 12 and a yoke 13. The grip body or mesh 10 is separably attached to the ring 11, and the yoke 13 is detachably connected to the rope sling 12. It will be understood that the several units are independent and interchangeable. Thus, several sizes of mesh 10 may be used with a single size of ring and sling assembly. On the other hand, only one size of yoke is required for each rig or set-up, but several sizes of yoke may also be used for different cable sizes if found advantageous. The three separate units are quickly and easily assembled on a cable 14 in the manner shown in Figs. 1, 8, 9 and 10 of the drawings, as will hereinafter be more fully explained.

As is shown more clearly in Fig. 2 of the drawings, the mesh 10 is preferably formed so that it is provided at one end with a series of circumferentially-arranged loops 15 and at its other or pulling end, with a plurality of alternate groups 16 of strands. The ends of the strands in each group 16 are united together by means of a lug 17. Each of the lugs 17 is preferably made of a short length of heavy walled tubular metal material and is securely fastened to a group 16 of strands by rotary or mechanical swaging. The lugs 17 are of uniform size and number for several diameter sizes of the mesh grip in a selected range in order that the several sizes of grips in any particular range may be interchangeable with a single size of ring. In the mesh bodies 10 illustrated in Figs. 1 and 2 of the drawings, the alternate strands are divided into four groups so that there are provided four lugs 17. It will also be noted that in the mesh body shown in Fig. 1, the mesh is braided with three parallel wires in each strand. This triple weave produces a flatter, broader surface contact with the sheath of the cable and therefore is not only stronger than the single or double strand weave (note Figs. 3 and 2, respectively), but also minimizes the possibility of damage to the surface of the cable sheath. While triple weave is theoretically possible with prior types of grips designed for slack pulling or luffing, it is not practical in such grips due to the large diameter of strands which are usually required in order to provide a grip having the necessary strength for this type of work. Such a large number of wires of large diameter would make the draft eyes usually provided on such prior grips, cumbersome and impractical. However, by providing the relatively small lugs 17 which are in turn fastened to the ring 11, this difficulty is overcome in the instant device which is only limited as to the number and size of wires used therein by the resultant stiffness of the mesh.

In the grip body 10 shown in Fig. 3 of the drawings, the mesh is shown split parallel to the axis thereof and

is closed around a cable with the aid of a flexible lacing wire or strand 18 in the usual manner. In other respects, this grip is similar to that shown in Fig. 2 of the drawings, the lugs 17 thereof being similar in construction and number to the lugs of the grip of Fig. 2, so that the grip of Fig. 3 may be used interchangeably with the grip shown in Fig. 2 on a ring 11.

The ring 11, as shown in Fig. 4 of the drawings, is composed of a hollow annularly-shaped member having a substantially cylindrically-shaped outer surface 20 and an inner surface 21 which is rounded at its outer end toward such outer surface, the outer ends of such surfaces forming with the outer end surface of the member, a continuous, smooth, curved surface having no sharp edges (note Fig. 11). The inner wall 22 of the ring member has a plurality of elongated or oblong holes 23, each provided with an enlarged central portion through which may be readily inserted a lug 17. The portions of each slot on each side of the enlarged portion thereof, are of such width as to prevent the removal of a lug 17 therethrough, but are wide enough to receive the group of wires attached to such lug. It will be understood that in assembling the mesh 10 with the ring 11, the lugs 17 are individually and progressively inserted in the center of the holes or slots 23 and pushed to either side thereof. Thus the lugs 17 are in the nature of latching members which are caught or latched in the holes 23 or latch receiving means provided in the wall 22 to fasten the mesh 10 to the ring 11. This assembling is readily accomplished without the use of tools. It will be understood that by reason of the mesh construction 10, the groups of wires 16 and the lugs 17 thereon will be positioned in substantially predetermined positions relative to each other and that because of the inherent spring action of the wires in such mesh, movement of such lugs 17 away from such normal relationship will be yieldingly resisted and such lugs will be returned to such normal relationship as soon as the displacing force has been removed. Therefore, when all of the lugs are in place, the spring action of the wire of the mesh 10 will resist movement of any one of the lugs toward the enlarged center of its respective slot. Thus, the mesh 10 is held fastened securely to the ring 11. The ends 24 of the wire rope sling 12 extend through and are attached to the ring member in any suitable manner.

While as has been previously explained, the mesh or grip structures shown in Figs. 2 and 3 of the drawings may be used with a ring of the construction shown in Fig. 4, it may be preferred for certain applications of use of the device, that the ring be of the split type and assembled with a split mesh such as shown in Fig. 3. As shown in Fig. 5 of the drawings, such a split ring may be composed of two similarly constructed, semi-circular parts 25 and 26, which are pivotally connected together at one end and are releasably locked together at their other ends to provide a complete ring. The ring halves 25 and 26 are each provided at one end with an outer extension 27 and 28, respectively, and at their other end with an inner extension 29 and 30, respectively. The extensions 28 and 29 of such ring halves interlock in overlapping relation and the outer extension 27 interlocks in overlapping relation with the inner extension 30. The overlapping extensions 28, 29 are provided with aligned apertures through which extends a hinge pin 31 for pivotally connecting such parts together. The pin 31 is composed of a piece of heavy walled tubularly-shaped metal material which is swaged to one end of the wire rope sling 12. The outer end of pin 31 is preferably enlarged and fixedly secured to extension 29, while the portion thereof located in extension 28 has an outside diameter less than the diameter of the aperture through extension 28, so that the latter and consequently ring half 26 are movable relative to ring half 25 and its extension 29.

The overlapping extensions 27 and 30 are also provided with aligned apertures through which extends a pin 32

similar to pin 31 and swaged to the other end of the wire rope sling 12. The aperture in extension 27 is of a size to slidably receive the reduced portion of pin 32, but not the enlarged outer end of the latter, while the aperture in extension 30 is of a size to slidably receive the enlarged outer end of pin 32. The end of extension 30 is provided with a transverse slot 33, which communicates throughout its entire length with the aperture of such extension. Slot 33 is wide enough to permit ready passage therethrough of the rope sling 12, but has a width less than the external diameter of the reduced portion of pin 32, so that when the pin is seated in the apertures of the extensions 27 and 28, such extensions are locked together. It will thus be seen that by pushing the rope sling 12 so as to remove the pin 32 from the aligned apertures in the extensions 27 and 30, the two ring halves 25 and 27 may be separated at such point to an open condition by pivoting half 26 about pin 31. When it is desired to close the ring, half 26 is moved back so that the two extensions 27 and 30 are in overlapping relation with the apertures thereof in alignment, the rope of sling 12 passing through slot 33 during such movement. The two halves 25 and 26 are then locked together by pulling on sling 12 to bring the pin 32 into locking position in the apertures of the extensions 27 and 30. After this has been accomplished, the grip body 10 may be closed by lacing the strand 18 through the wire loops provided along the side edges of such grip.

On the other or closed end of the sling 12 is mounted the yoke 13. As shown more clearly in Figs. 6 and 7 of the drawings, the yoke 13 is composed of a V-shaped body whose part or arm 35 has a smooth, outer surface adapted to engage the sheath of a cable in the use of the device, as will hereinafter be more fully described. The outer end of arm 35 is provided with a female thread 36 with which threadedly engages the outer threaded end of a bolt 37. The shank of bolt 37 extends through an aperture provided in the outer end of the other arm 38 of the yoke. The bolt 37 is removable to permit the attachment to the yoke of the sling 12 and the conventional pulling loop or eye formed at the end of the workman's pulling line 40 (note Figs. 8–10) and to lock such parts together in connected relation. The bolt 37 is of such length, that when it is screwed in position with the head thereof engaging the outer surface of yoke arm 38, the threaded end will not extend to the cable engaging outer surface of arm 35. When the device is in use, the cable will be positioned in the seat 39 provided between the yoke arms 35 and 38.

Figs. 8–10 of the drawings, show the use of the device of the invention. The grip 10 and ring 11 have been assembled on the cable 14 with the grip 10 pushed back into the duct 41, as shown in Fig. 8, for maximum length of hitch or pull during a single pull in removing the cable from such duct. The workman's pulling line 40 has been attached directly to the yoke 13 in the manner previously described without the use of a shackle or wing link, as is usually required with prior grips made for this purpose. The smooth, flat surface of the yoke arm 35 engages under the cable 14. It will be noted that in this position of the parts, such yoke surface is flat against the cable and the rope or cable between the yoke 13 and the sheave 42 is straight, the offset being taken by the rope sling 12. As the pull on the cable 40 starts the tension increases, the rope sling 12 tends to straighten out and the increased pressure of the yoke on the cable forces the latter up, as shown in Fig. 9 of the drawings. As the pulling action continues, the rope sling 12 comes into alignment with the grip 10 and straddles the cable at the bend without touching the cable sheath. At this time, the yoke 13 will have moved out of contact with the cable, as shown in Fig. 10 of the drawings. The cable 14 will make the maximum allowable bend before the yoke reaches the sheave 42, thus permitting a maximum length of pull in each pulling operation. As

the yoke 13 will not pass through the sheave 42, but will act as a stop to prevent any further pull, it will prevent an overpull which might kink the cable. At the end of each pulling operation, the device is pushed back on the cable to the position shown in Fig. 8 for the next pull.

It should be noted that as the ring 11 is smooth and curved at its outer end, as has been previously explained, there is prevented, during the pulling action, damage by such ring to the cable, and there is provided an excellent and safe hand-hold for the operator in moving and positioning the unit on the cable. As this latter operation is usually performed in the limited space of a manhole and the pulling line 40 is operated by a machine outside the manhole, accidents to the operator's hands, while handling offset slack grips, are not uncommon. It will also be noted that as the yoke 13 presents a smooth, flat surface to the face of the cable, it will not, under load during the pulling operation, mark or otherwise damage the cable as is frequently the case when auxiliary hardware such as shackles and swing links are used with devices of this type.

While I have hereinabove described and illustrated in the drawings, preferred embodiments of my invention, it will be apparent to those skilled in the art, that changes and modifications may be made therein without departing from the spirit of the invention or the scope of the appended claims. Where in the claims I refer to a "draft device," or "draft member," it will be understood that such term designates the device or member of the grip on which the pulling force is exerted in the use of the grip. In the grip illustrated in the accompanying drawings, the "draft device" or "draft member" of the grip is the rope sling 12.

I claim:

1. In a gripping device, a gripping member composed of a plurality of wire strands interwoven to form an open mesh body portion adapted to be placed in surrounding gripping relation with an article, the strands at one end of said body being arranged into a plurality of circularly disposed groups, a latching member provided on each of said groups and securing the strands in said group together, a ring member having an inside diameter such as to enable the article held by said gripping member to extend therethrough, a plurality of spaced latch receiving means circumferentially arranged on the inner end of said ring member and adapted to be detachably interlocked with the latching members on said groups to detachably connect said body portion to said ring member, and a draft member permanently connected to spaced parts of said ring member and extending from the forward end of said ring member, said draft member being formed to enable the free insertion of the article through said gripping and ring members.

2. In a gripping device, a gripping member composed of a plurality of wire strands interwoven to form an open mesh body portion adapted to be placed in surrounding gripping relation with an article, the strands at one end of said body being arranged into a plurality of circularly disposed groups, a lug secured to each of said groups and securing the strands in said group together, a ring member having an inside diameter such as to enable the article held by said gripping member to extend therethrough, a plurality of locking means circumferentially arranged on the inner end of said ring member and adapted to be detachably interlocked with the lugs on said groups to detachably connect said body portion to said ring member, and a flexible sling permanently connected by its ends to substantially diametrically spaced places of said ring member and extending from the forward end of said ring member in the form of a loop of sufficient size as to enable the free insertion of the article through said gripping and ring members.

3. In a gripping device, a gripping member composed of a plurality of wire strands interwoven to form an open mesh body portion adapted to be placed in surrounding gripping relation with an article, a ring member having an inside diameter such as to enable the article held by said gripping member to extend therethrough, locking means for detachably connecting one end of said body portion to said ring member, said locking means including latching members attached in spaced circular relation to one end of said body portion and spaced circularly arranged latch receiving means provided on the inner end of said ring member, and a draft device permanently connected to spaced parts of said ring member and extending from the forward end of said ring member, said draft device being formed to enable the free insertion of the article through said gripping and ring members.

4. In a gripping device, a gripping member composed of a plurality of wire strands interwoven to form an open mesh body portion adapted to be placed in surrounding gripping relation with an article, a plurality of locking members secured to said wire strands at one end of said body and arranged in spaced, circular relation, a ring member having an inside diameter such as to enable the article held by said gripping member to extend therethrough and having a plurality of slots arranged in circular spaced relation on the inner end thereof, each slot having an enlarged portion through which a locking member may be inserted and a reduced portion adapted to receive the strands to which such locking member is attached but to prevent the passage therethrough of said locking member, whereby said body member may be detachably connected to said ring member so that the article to be held may be inserted through both of said members, and a draft device permanently connected to spaced parts of said ring member and extending from the forward end of said ring member, said draft device being formed to enable the free insertion of the article through said gripping and ring members.

5. In a gripping device, a gripping member composed of a plurality of wire strands interwoven to form an open mesh body portion adapted to be placed in surrounding gripping relation with an article, a plurality of locking members secured to said wire strands at one end of said body and arranged in circular spaced relation, a cylindrically-shaped ring member having an inside diameter such as to enable the article held by said gripping member to extend therethrough and having an inside annular wall provided with a plurality of slots arranged in circular spaced relation, each slot having an enlarged portion through which a locking member may be inserted and a reduced portion adapted to receive the strands to which such locking member is attached but to prevent the passage therethrough of said locking member, whereby said body member may be detachably connected to said ring member so that the article to be held may be inserted through both of said members, and a draft loop permanently connected by its ends to spaced parts of said ring member and extending from the forward end thereof, the size of said loop being such as to enable the free insertion of the article through said gripping and ring members.

6. In a gripping device, a gripping member composed of a plurality of wire strands interwoven to form an open mesh body portion adapted to be placed in surrounding gripping relation with an article, a plurality of locking members secured to said wire strands at one end of said body and arranged in circular spaced relation, a hollow cylindrically-shaped ring member having an inside diameter such as to enable the article held by said gripping member to extend therethrough and having an outer end provided with a continuous smooth curved surface and having an annularly shaped inner end wall provided with a plurality of slots arranged in circular spaced relation, each slot having an enlarged portion through which a locking member may be inserted and a reduced portion adapted to receive the strands to which such locking member is attached but to prevent the passage therethrough of said locking member, whereby said body member may be de-

tachably connected to said ring member so that the article to be held may be inserted through both of said members, and a flexible sling member permanently connected by its ends to substantially diametrically spaced places of said ring member and extending from the outer end thereof in the form of a loop of sufficient size as not to obstruct the insertion of an article through said gripping and ring members.

7. In a gripping device, a gripping member composed of a plurality of wire strands interwoven to form an open mesh body portion adapted to be placed in surrounding gripping relation with an article, a ring member composed of two semi-circularly shaped halves and having an inside diameter such as to enable the article held by said gripping member to extend therethrough, locking means for detachably connecting one end of said body portion to spaced, circularly arranged portions of said ring member, and a flexible sling member connected at its ends to said ring member, one end of said sling member having one end formed to pivotally connect said two ring halves together and having its other end formed to detachably connect the other ends of said two ring halves together, said sling member forming a draft loop of sufficient size as not to obstruct the insertion of the article through said gripping and ring members.

8. In a gripping device, a gripping member composed of a plurality of wire strands interwoven to form an open mesh body portion adapted to be placed in surrounding gripping relation with an article, a ring member composed of two semi-circularly shaped halves and having an inside diameter such as to enable the article held by said gripping member to extend therethrough, each half of said ring member having two end extensions adapted to seat in overlapping relation on the end extensions of the other half, locking means for detachably connecting one end of said body portion to spaced, circularly arranged portions of said ring member, and a flexible sling member connected at its ends to said ring member, one end of said sling member being connected to an extension of one of said ring halves and being formed to provide a hinge connection with the overlapping extension of the other ring half, the other end of said sling member being formed to detachably connect the other overlapping extensions of said ring halves, said sling member forming a draft loop of sufficient size as not to obstruct the insertion of the article through said gripping and ring members.

9. In a gripping device, a gripping member composed of a plurality of wire strands interwoven to form an open mesh body portion adapted to be placed in surrounding gripping relation with an article, a ring member composed of two semi-circularly shaped halves and having an inside diameter such as to enable the article held by said gripping member to extend therethrough, each half of said ring member having two end extensions adapted to seat in overlapping relation on the end extensions of the other half, an extension in one overlapping set having an opening therethrough and one extension in the other overlapping set having an opening therethrough and the other extension in said other overlapping set having a U-shaped slot with a constricted opening, said opening and slot in the extensions of said other set being in alignment, locking means for detachably connecting one end of said body portion to spaced, circularly arranged portions of said ring member, and a flexible sling member connected at its ends to said ring member, one end of said sling member extending through the opening in the extension of the one overlapping set and being secured to the other extension of such set, whereby said sling end pivotally connects the two ring halves together, the other end of said sling member extending through the opening of the extension in said other set and having an enlarged portion adapted to seat in said slot in an axial direction but having a transverse dimension greater than the width of the restricted opening of said slot, the transverse width of said sling being smaller than the width of the opening of such slot, and said sling member forming a draft loop of sufficient size as not to obstruct the insertion of the article through said gripping and ring members.

10. A gripping device such as claimed in claim 9, in which said sling is provided on each end with a lug having an enlarged outer end and a reduced inner end, the reduced end of one of said lugs extending through the opening in the extension of one overlapping set and the enlarged end of such lug being secured to the other extension of such set, the reduced end of the other of said lugs being adapted to seat in the opening of the extension in said other set and the enlarged end of such lug being adapted to seat in such slot.

11. In a gripping device, a gripping member composed of a plurality of wire strands interwoven to form an open mesh body portion adapted to be placed in surrounding gripping relation with an article, a plurality of latching members secured to said wire strands at one end of said body and arranged in spaced, circular relation on said body end, a ring member having an inside diameter such as to enable the article held by said gripping member to extend therethrough and having an annularly-shaped inner end wall provided with a plurality of slots arranged in circular, spaced relation, said slots as a whole being arcuately shaped and extending in arcuate fashion about the central axis of said ring member, each slot having an enlarged portion through which a latching member may be inserted and a reduced portion adapted to receive the strands to which such latching member is attached but to prevent the passage therethrough of said latching member, whereby said gripping member may be detachably connected to said ring member so that the article to be held may be inserted through both of said members, the inherent resiliency of the strands of said gripping member tending to maintain said latching members associated with the restricted portions of said slots, and a draft device permanently connected to spaced parts of said ring member and extending from the forward end of said ring member, said draft device being constructed to enable the free insertion of the article through said gripping and ring members and to coact with said ring member and latching members to apply an evenly distributed load on the strands of said gripping member.

12. In a gripping device, a gripping member composed of a plurality of wire strands interwoven to form an open mesh body portion adapted to be placed in surrounding gripping relation with an article, a plurality of latching members secured to said wire strands at one end of said body and arranged in spaced, circular relation on said body end, a hollow cylindrically-shaped ring member having an inside diameter such as to enable the article held by said gripping member to extend therethrough and having an annularly-shaped inner end wall provided with a plurality of slots arranged in circular, spaced relation, said slots as a whole being arcuately-shaped and extending in arcuate fashion about the central axis of said ring member, each slot having an enlarged portion through which a latching member may be inserted into the interior of said ring member, and a reduced portion adapted to receive the strands to which such latching member is attached but to prevent the passage therethrough of said latching member, whereby said gripping member may be detachably connected to said ring member so that the article to be held may be inserted through both of said members, a plurality of said slots having a pair of such reduced portions extending from opposed sides of the enlarged portions thereof to enable the associated latch members to be interlocked in two directions and the inherent resiliency of the strands of said gripping member tending to maintain said latching members associated with the restricted portions of the slots with which they have been engaged, a flexible sling extending from the forward end of said ring member in the form of a loop of sufficient size as to permit the free insertion of an

article through said gripping and ring members, and means permanently connecting the inner ends of said sling to diametrically-spaced parts of said ring member.

References Cited in the file of this patent

UNITED STATES PATENTS

652,617	Hotz	June 26, 1900
1,656,676	Mills	Jan. 17, 1928
1,735,561	Austin	Nov. 12, 1929
1,807,993	Martin	June 2, 1931
1,879,006	Anderson	Sept. 27, 1932
1,994,674	Van Inwagen	Mar. 19, 1935
2,112,281	Ferris	Mar. 29, 1938
2,268,598	Kellems	Jan. 6, 1942
2,302,198	Ehmann	Nov. 17, 1942
2,318,164	Kellems	May 4, 1943
2,551,803	Leonard	May 8, 1951

FOREIGN PATENTS

16,140	Great Britain	Aug. 12, 1901