May 4, 1943. D. L. KELLEMS 2,318,164

LIFTING AND/OR HOLDING DEVICE

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Fig. 1.

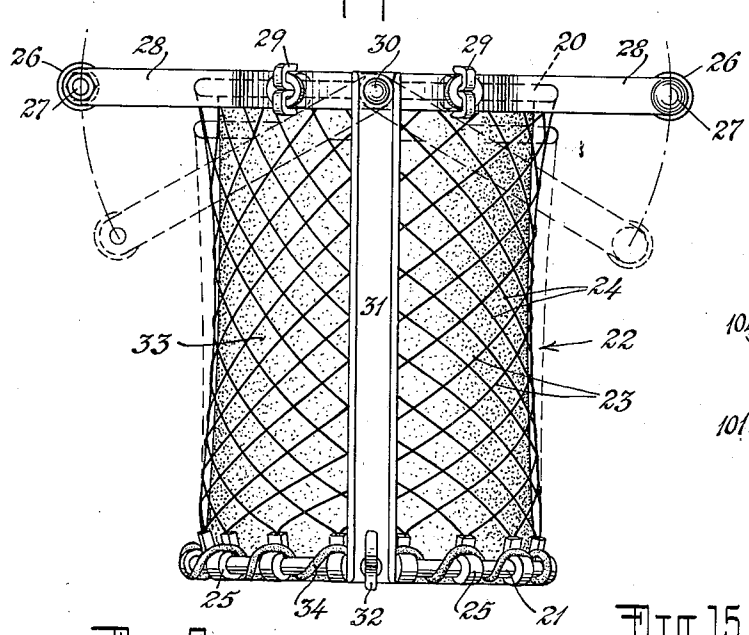


Fig. 2.

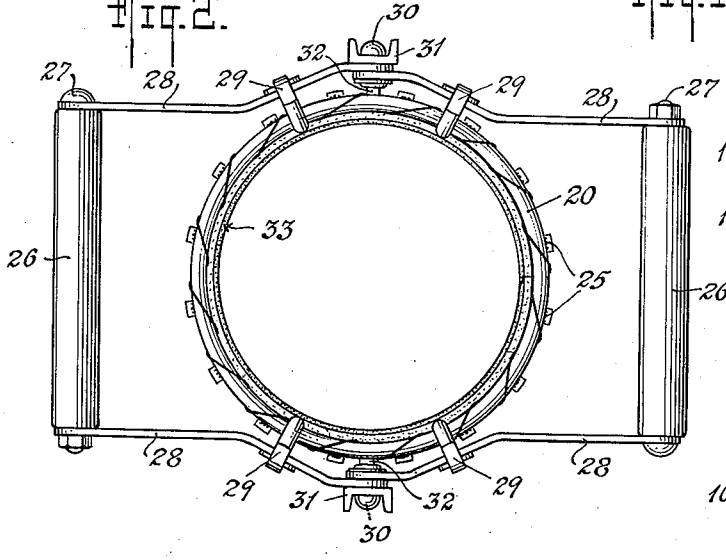
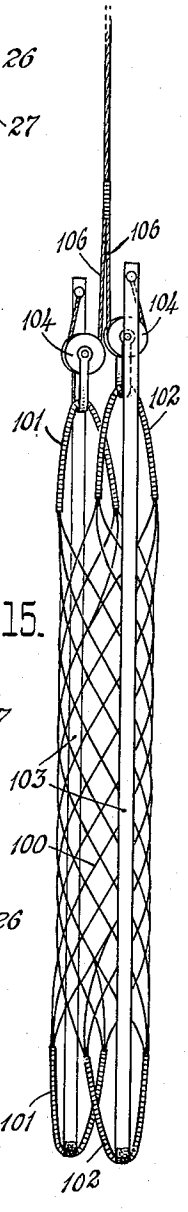


Fig. 15.



WITNESS

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LIFTING AND/OR HOLDING DEVICE

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Fig. 3.

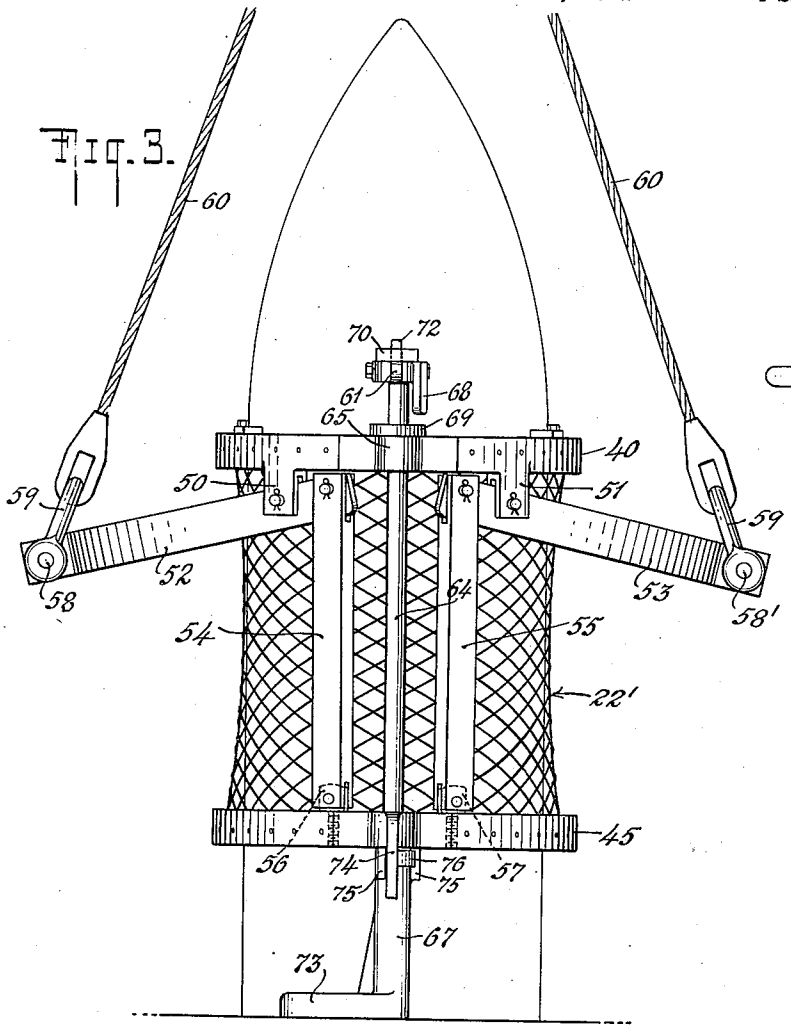


Fig. 4.

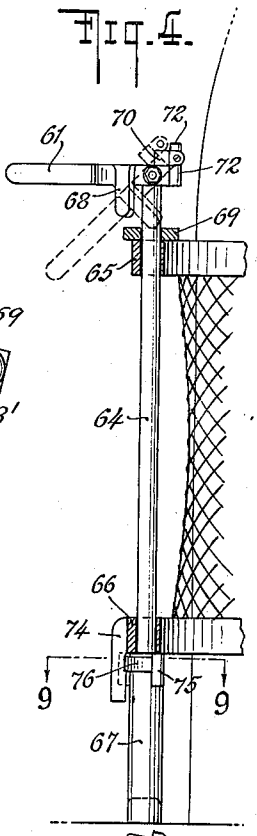


Fig. 9.

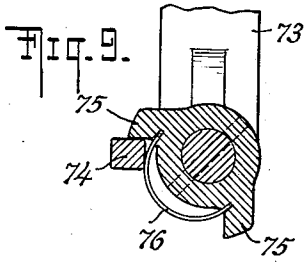


Fig. 10.

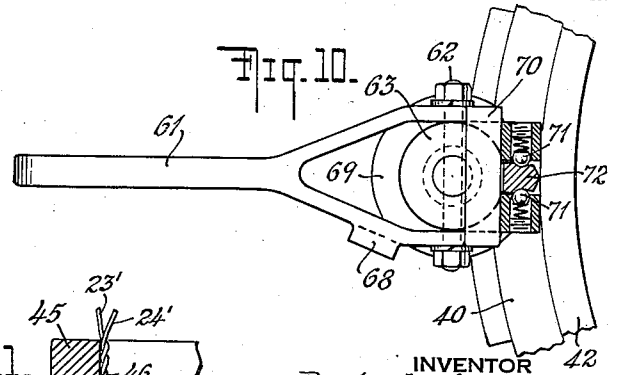
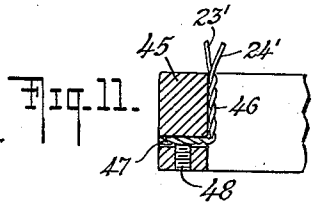


Fig. 11.



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LIFTING AND/OR HOLDING DEVICE

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Fig. 5.

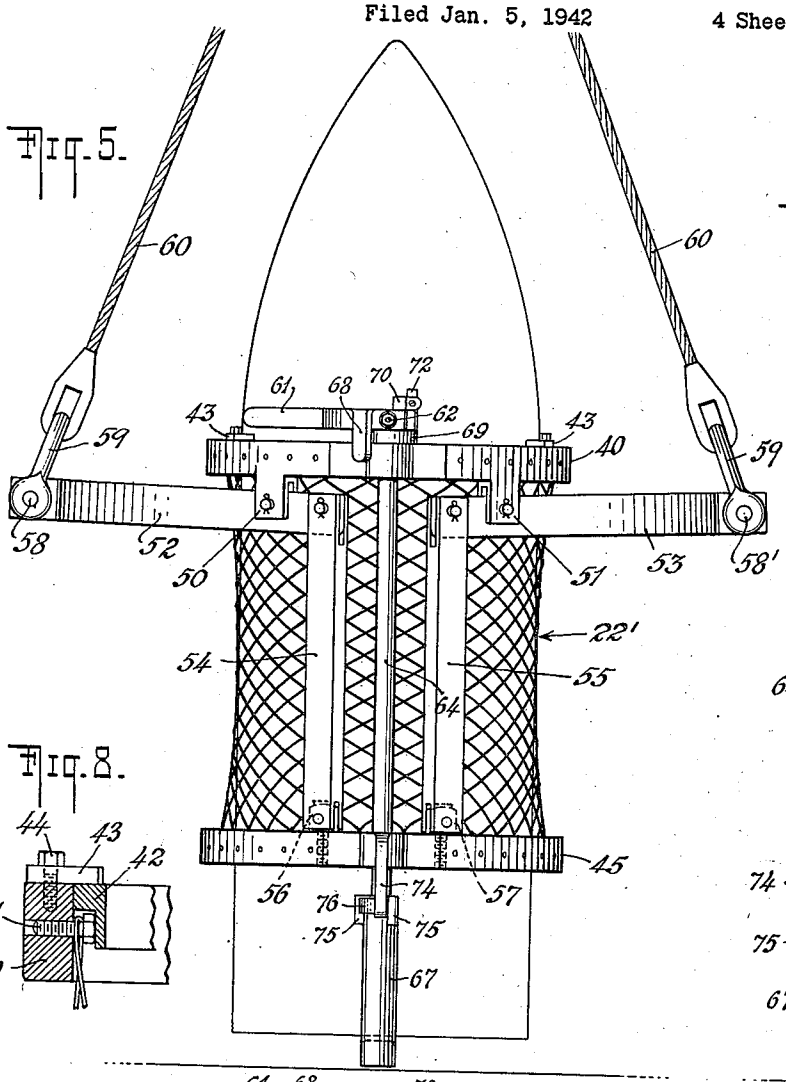


Fig. 6.

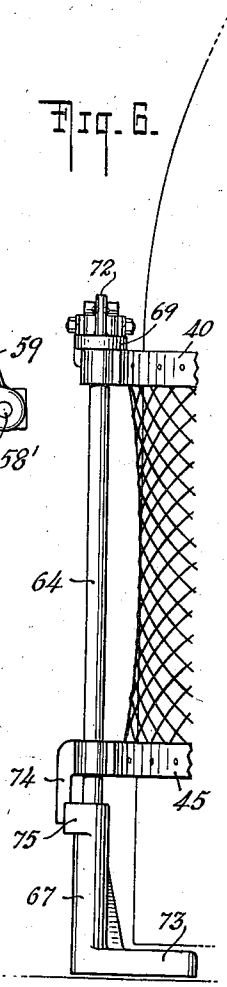
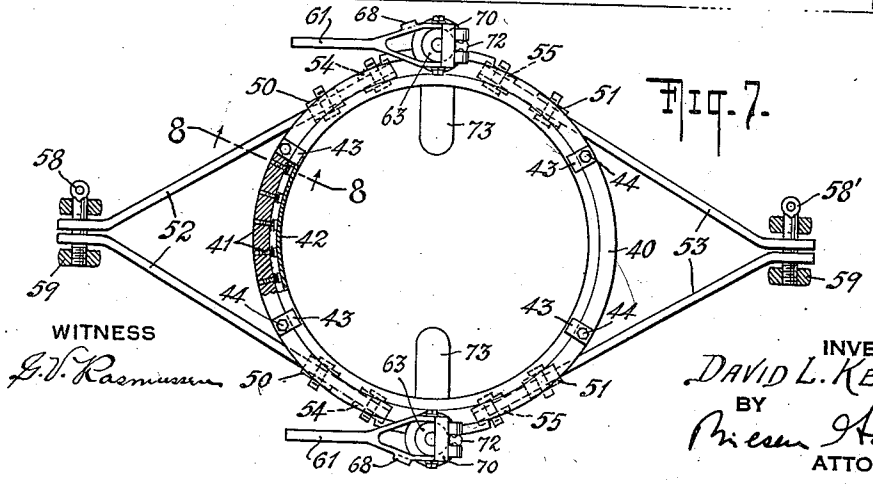


Fig. 8.

Fig. 7.



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LIFTING AND/OR HOLDING DEVICE

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Fig. 12.

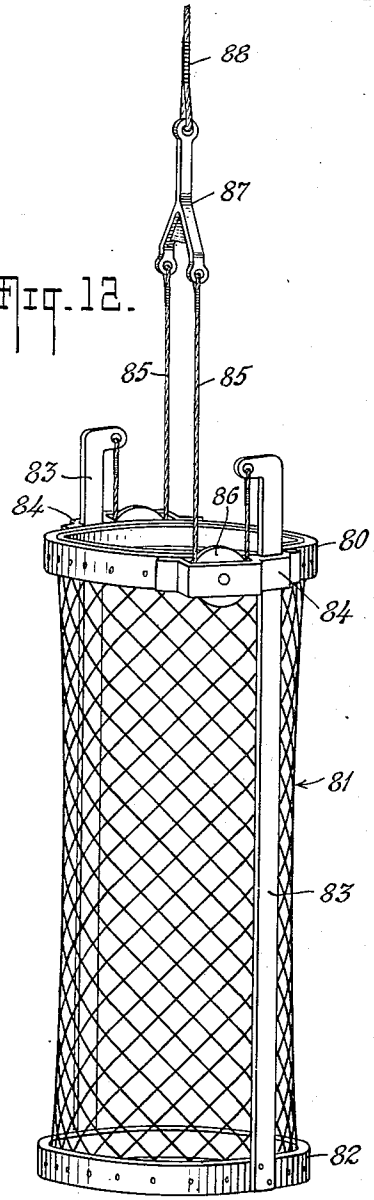


Fig. 13.

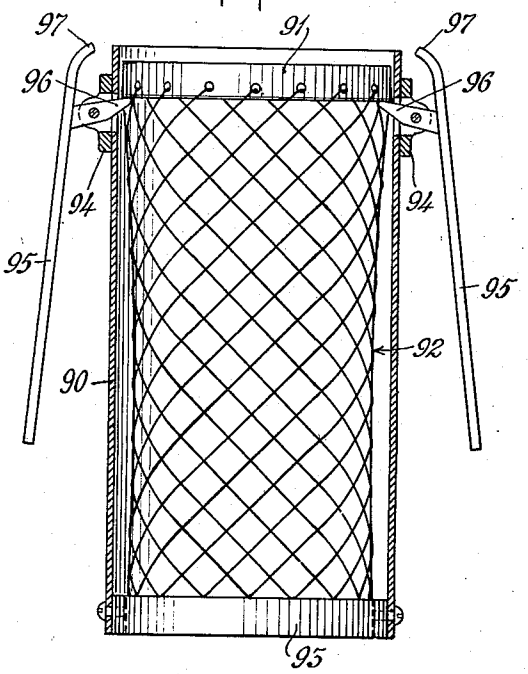
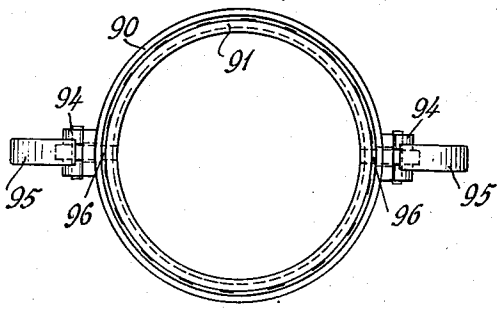


Fig. 14.



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Patented May 4, 1943

2,318,164

UNITED STATES PATENT OFFICE

2,318,164

LIFTING AND/OR HOLDING DEVICE

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Application January 5, 1942, Serial No. 425,664

15 Claims. (Cl. 294—86)

This invention relates to a device having use in the lifting of objects from a place of rest and in the carrying of the lifted objects to a place of discharge.

The principal object of the invention is to provide an improved lifting device which will grip an object more securely than devices heretofore utilized for this purpose.

A specific object of the invention is to provide an improved lifting and/or holding device whose gripping and releasing operations are readily and effectively controlled through associated cooperating lever mechanisms.

A further object of the invention is to provide an improved lifting or holding device in which are included means capable of utilizing the pulling or lifting forces applied to increase the gripping action of the device upon an object to an extent proportional to the intensity of such applied forces so that the greater the force that is required to be applied to the device to move an object, the greater will be the gripping action of the device on the object.

A still further object of the invention is to provide an improved lifting device having control mechanisms which make it entirely safe to move highly dangerous objects with the device.

With above and other objects in view, the present invention provides a lifting device which, broadly speaking, includes a tubular basket or meshed tube adapted to receive the object to be lifted and constructed by winding a series of strands so that they spiral in opposite directions around the longitudinal, central axis of the basket or tube, the strands being arranged in open meshed fashion to enable the basket or tube to be considerably varied in a radial direction by endwise compression or expansion thereof to accommodate objects having widely varying shapes and sizes. In accordance with the invention, a leverage or pulley system is connected to spaced portions of this basket or baskets, preferably the ends thereof, and such leverage or pulley system is preferably operated automatically in the lifting of the device with the object in such manner as to cause the basket or tube to exert a gripping action on the object proportional to the weight of the object being lifted and the forces required to lift the object and the device.

The novel features of the invention as well as the advantages thereof will become more clear after a perusal of the following description, read in connection with the accompanying drawings, in which are illustrated preferred embodiments of the invention and in which Fig. 1 is a front elevational view of one form of the lifter showing in full lines the normal position of the parts and showing in dotted outline the manner in which the parts are adjusted for the reception of an object therein; Fig. 2 is a top plan view of the device shown in Fig. 1; Fig. 3 is a side elevational view of another form of the invention and illustrating the position of the parts thereof just prior to the lifting of the device; Fig. 4 is a side elevational view, partly in section, of the control mechanism embodied in the device shown in Fig. 3 and illustrating in dotted outline the manner in which the control device is rendered inoperative to extend the basket or tube of the device; Fig. 5 is a front elevational view showing the position of the parts during the lifting operation; Fig. 6 is a side elevational view of the control mechanism showing the condition of the same during the lifting operation; Fig. 7 is a top plan view, partly in section, of the device shown in Fig. 5; Fig. 8 is a sectional view taken along the line 8—8 of Fig. 7; Fig. 9 is a sectional view taken along the line 9—9 of Fig. 4; Fig. 10 is a top plan view of the operating lever of the control mechanism, a portion thereof being in section to illustrate more clearly the operation of the parts thereof; Fig. 11 is a transverse section of the lower ring of the device illustrated in Fig. 3; Fig. 12 is a perspective elevational view illustrating another embodiment of the invention; Fig. 13 is a side elevational view, partly in section, showing still another form of the invention; Fig. 14 is a top plan view of the device illustrated in Fig. 13, and Fig. 15 is an elevational view illustrating a still further modification of the invention.

In the embodiment of the invention illustrated in Figs. 1 and 2 of the drawings, the reference character **20** indicates generally the ring which forms the top or upper end of the body of the lifting device. The lower or bottom ring is indicated by the numeral **21**. Intermediate the spaced rings **20** and **21** is formed an open meshed tubular structure designated generally by the reference numeral **22** and composed of a plurality of wire strands folded intermediate their ends about the upper ring **20** and extending in spiral fashion towards the bottom ring **21**, the sections **23** of the wire strands being interwoven or braided with the sections **24** of the strands and spiralling about the central, longitudinal axis of the structure in a direction opposite to that of the wire sections **24**, as can be clearly seen in Fig. 1 of the drawings. As the loops formed by the

strands around the upper ring 20 are formed in the construction of the basket 22, the ring 20 is woven into the fabric construction and becomes an integral part thereof. The ends of the strand sections 23 and 24 may be "deadened" by twisting two oppositely spiralling wires together and permanently securing such twisted ends to the bottom ring 21 in any suitable fashion as by soldering or by passing them through spaced apertures in the ring 21 and then affixing them to such ring or, as is shown in Fig. 1 of the drawings, by securing them in tubular clasps or clips 25 which are bent around and secured to the lower ring 21.

It will be understood from the foregoing description, that the open meshed structure 22 is so formed that it may be considerably varied in diameter by endwise compression and expansion thereof. Thus it may be expanded radially by endwise compression forces to enable it to be placed readily over and upon the portion of the article to be lifted, and when the compression forces are removed it will automatically contract radially to frictionally engage the outer surfaces of the portion of the object which it encloses. When an endwise pull or force is thereupon exerted tending to extend the open meshed structure, the strands of the latter will tighten upon the exterior surface of the object and thereby secure a firm, frictional grip. The greater the endwise force or pull exerted upon the open meshed structure the greater will be the gripping action of the latter upon the object. As both of the rings 20 and 21 are preferably made of relatively stiff wire and have a diameter greater than the diameter of the open meshed structure, they tend to increase the rigidity of the open meshed structure and to facilitate the gripping action thereof, due to the fact that they cause an initial tension to be placed on the intermediate portions of the open meshed structure.

Secured to the upper ring 10 are a pair of spaced grips or handles each composed of a cylindrically-shaped handle member 26 made of wood or any other suitable material and through which extends a bolt 27 whose ends are supported upon and connected to the outer ends of its associated pair of lever members 28, 28. The two lever members 28, 28 of each handle are each pivotally supported intermediate its ends by a cotter pin 29 whose intermediate portion or head is bent around and surrounds the upper ring 20 and whose legs extend through an aperture provided in the lever member 28 and are then bent in opposite directions about the upper and lower sides of the lever member. A washer may be provided on the legs of the cotter pin intermediate the spread portions of such legs and the outer surface of the lever 28. By this construction there is provided a simple, strong, pivotal connection between the levers 28 and the upper ring 20, the heads of the cotter pins 29 being free to move back and forth on the ring to enable the pivotal points of the levers 28 to be shifted relative to the ring during the expansion and contraction of the basket or tube 22. The inner ends of each pair of lever members 28, 28 are connected to the upper ends of two upstanding, rigid, channel-shaped, metal straps 31, 31 positioned in diametrically opposed relation on the device and extending longitudinally of the same to the lower ring 21. The connection of the lever members 28 with the rigid straps 31 is a pivotal one and may be made by passing a bolt 30 through each strap and its two associated lever members 28 and then flattening the inner end of such bolt against a washer to make a permanent connection. The lower ends of the rigid straps 31, 31 are connected to the bottom ring 21 by cotter pins 32 which are folded around the bottom ring 21 and then passed through apertures in the bottom ends of the straps, the ends or legs thereof being then spread in opposed relation within the channeled strap members, as is shown more clearly in Fig. 1 of the drawings, to secure the straps in position. Preferably, the head of each cotter pin 32 is maintained against movement on the ring 21 by spacer members which are positioned on each side of the cotter pin on the ring and between the two clasps 25 between which such pin is positioned.

In the use of the above described device, the bottom end thereof is inserted over the object to be lifted and is forced down on such object by the operator pushing down on the two handle members 26, 26. As a result of this action, the handles will be moved to the dotted line position illustrated in Fig. 1 of the drawings, thereby causing the open meshed structure 22 to be enlarged in a radial direction to an extent where it will readily slip over the object. When the device is properly positioned on the object, the operator, by lifting the device upwardly through his grip on the handle members 26, 26, will cause the lever members 28 to pivot upwardly about the cotter pins 29, 29, thereby forcing the rigid strap members 31, 31 and the lower ring 21 downwardly and consequently elongating the tubular member to the extent that the strands thereof are caused to come into tight gripping relation with the exterior surfaces of the portion of the object enclosed thereby. Preferably, the normal diameter or cross-sectional area of the open meshed structure is less than the diameter or cross-sectional area of the object to be lifted so that when the device is placed on the object it will have a longitudinal length less than that of normal, as is indicated by the dotted lines in Fig. 1 of the drawings. Thus, the wire structure will by such insertion be placed under an initial tension causing it to apply an initial gripping action on the object as soon as it is in place thereon. When thereupon lifting pressure is applied to the handles 26, 26, such pressure, through the lever members 28, the strap members 31 and the bottom ring 21, will serve to further bind the open meshed structure more closely and securely against the exterior surfaces of the object. The greater the force required to lift the object, the greater will be the binding action of the device upon the object so that a firm gripping and anchoring of the lifting device is obtained on the object and the latter may be safely carried to any place desired. Due to the fact that the diameter of the bottom ring 21 is greater than the diameter of the body portion of the open meshed structure 22, there is imparted to the latter a rigidity which enables the device to be forced down over the object without any danger of the open meshed structure bending along its longitudinal axis or collapsing during the application of such force, while at the same time enabling such structure to expand radially to receive the object.

It will be evident from the foregoing that the invention provides a simple, effective lifting construction which is durable and can be produced at relatively low cost. The leverage is relatively

rigid and its ratio can be readily made as high as desired, thus making it possible to provide a grip which is shorter in length and/or greater in diameter than those which have heretofore been made and which can be utilized for the lifting of a large variety of objects and for many purposes for which devices of this type were not heretofore adapted. It will also be apparent that the device is well adapted for either manual or mechanical use. In the latter case, the handles of the device can be constructed so that they can be readily engaged by hooks and chains from a machine or crane. In certain uses it may be advantageous to increase the frictional gripping capacity of the device by lining the interior of the basket or tube 22 with a material having high frictional characteristics such as felt, leather or rubber. In Figs. 1 and 2 of the drawings, a leather lining of this character is designated by the reference numeral 33. The leather lining is maintained in proper position within the basket or tube 22 by securing it to the bottom ring 21 with any suitable means such as the leather thong 34 illustrated in Fig. 1 of the drawings. It will be evident that the leather linings will increase the frictional grip of the device on the object and thereby reduce any possibility of the object becoming separated during the lifting action. As the lining 33 also decreases the diameter of the member 22 by the thickness of such lining, the grip of the device on an object will be correspondingly tighter. These linings possess the further advantage that they protect the surfaces of the object from becoming scratched and enable the lifting of painted and fragile objects without damage. These linings also serve to insulate the object from the gripping device and consequently the operator or the lifting mechanism, which accomplishment may be of decided advantage under certain conditions.

Instead of connecting the lever members 28 of the handles to a pair of rigid straps 31, as in the above described device, there may be provided a pair of basket elongation control straps for each handle in order to obtain a more even distribution of the applied forces to the meshed structure or basket. A device of this construction is illustrated in Figs. 3 to 11 of the drawings, in which construction the upper ring of the device is composed of an outer ring member 40 provided with a plurality of circumferentially arranged apertures through which extend a similar member of threaded bolts 41 whose heads are positioned interiorly of the ring 40 and in spaced relation to the interior surfaces of the latter, as can be more readily seen in Fig. 7 of the drawings. Intermediate the ring 40 and the heads of such bolts or pins 41, are looped the upper ends of the strands or wires of the basket or woven structure 22'. The looped portions of the strands are locked in position by an inner guard ring 42 which is swedged to the interior surfaces of the ring 40 (see Fig. 8) and is prohibited against vertical movement relative to the ring 40 by the heads of the bolts or pins 41 and finger members or lugs 43 which extend over the upper surfaces of the inner ring 42 and are fixedly secured at their outer ends to the ring 40 by means of the bolts 44. The woven structure 22' is connected to the bottom ring 45 by spiralling the ends of the strand sections 23' and 24' together in pairs to form the spiralled terminal ends 46 (see Fig. 11), inserting such ends through the transverse apertures 47 provided in the bottom ring 45 and securing the inserted portions of the spiralled ends 46 in position relative to the ring 45 by means of set screws 48 threaded through vertical apertures provided in the bottom edge portion of the ring 45.

Depending from the upper ring 40 are two pairs of slotted lever brackets 50, 50 and 51, 51 which pivotally support the lever members 52, 52 and 53, 53, respectively. The inner ends of the lever members 52, 52 are pivotally connected to the upper ends of two rigid strap members 54, 54 which are pivotally connected at their lower ends to the vertically disposed members 56, 56 secured to and extending upwardly from the bottom ring 45. In a similar manner, the inner ends of the lever members 53, 53 are connected to the upper ends of the strap members 55, 55 pivotally supported on the members 57, 57 provided on the ring 45. The outer ends of the levers 52, 52 are loosely connected together by a bolt 58 while the outer ends of the levers 53, 53 are similarly connected by a bolt 58'. Connected to the bolts 58, 58' are U-shaped couplings 59, 59 to which are connected the cables 60, 60 by which the device may be lifted.

As the device illustrated in Figs. 3 and 5 operates in a manner somewhat similar to the device illustrated in Fig. 1 of the drawings, it is not believed necessary to describe its operation in detail. Suffice it to say that the forces which extend the gripping portion 22' of the device are applied by the levers 52 and 53 and to the member 22' through the strap members 54, 55, the upper ring 40 and the bottom ring 45. The amount of the extending force will depend upon the pulling or lifting force required or rather upon the weight of the object being lifted. Thus, the more the object weighs, the greater will be the extending force and the greater the gripping action upon the object. This makes it possible to lift heavy objects with complete safety. As an additional feature of this construction, however, there is provided on each side of the device a control and safety mechanism, each of which includes an operating lever 61 pivotally mounted at its inner end on a pin 62 which extends through aligned openings in a collar 63 and the upper end of a vertical rod 64 upon which the collar 63 is secured. The rod 64 is revolvably and slidably connected to the device by means of a strap 65 provided on the upper ring 40 and a strap 66 which is provided on the lower ring member 45. Secured to the lower end of the rod 64 is a second elongated collar member 67, the distance between the same and the upper collar 63 being sufficient to enable the rod 64 to be shifted lengthwise for a small distance relative to the straps 65 and 66. The operating lever 61 is provided with a finger 68 which is adapted to be moved into engagement with a loose washer 69 mounted on the rod 64 and resting on the upper end of the strap 65, to maintain the rod 64 in a raised position relative to the device, as is indicated in dotted outline in Fig. 4 of the drawings. Normally, the lever 61 is in the full line position shown in Fig. 4 of the drawings, with the integral cross bar 70 thereof (see Figs. 4 and 10) resting on the collar 63. In this position of the lever 61 a pair of spring pressed balls 71 provided on the cross bar 70 and constituting latch members are engaged with recesses provided on an upright member 72 integral with the collar 63, to maintain the lever 61 in this position until positively removed therefrom. By depressing the lever 61, however, the locking en-

gagement of the latch members 72 with the finger 72 is broken and the stop finger 68 is moved to the dotted line position hereinabove mentioned.

The lower end of the elongated collar or cylindrical member 67 has integrally formed therewith a transverse foot member 73 extending at right angles to the rod 64. By rotating the operating lever 61 and consequently rod 64, the foot member 73 can be swung from the position shown in Figs. 3 and 4 of the drawings to the position shown in Figs. 5 and 6 of the drawings where such member will extend inwardly towards the axial center of the device. Rotational movement of the lever 61 and the rod 64 is restricted by means of a depending finger 74 connected to the lower strap 66 and cooperating with a pair of spaced stop blocks 75, 75 integrally formed on the member 67. The position of the finger 74 relative to the stops 75, 75 is maintained until positively disturbed by means of a curved spring member 76 whose ends are supported in slots provided in the member 67 and whose intermediate outer surface portion frictionally engages the inner surface of the finger 74, as is illustrated more clearly in Fig. 9 of the drawings.

It will be understood from the foregoing description that when the operating lever 61 is in the dotted line position shown in Fig. 4 of the drawings, the finger 68 by its engagement with the loose washer 69 holds the upper and lower rings 40 and 45, respectively, at their minimum distance, thus holding the grip or basket 22' in its fully expanded and released condition. With the device in this condition, the crane or hoist lowers the device over the object to be lifted, such as, the shell illustrated in Figs. 3 and 5 of the drawings. During the lower of the device over the object, the foot or safety members 73 come into contact with the ground and fix the position of the lifter with respect to the object. The operator then lifts the lever 61 of each control mechanism from the position shown in dotted outline in Fig. 4 of the drawings to the position shown in full lines in such figure. The withdrawal of the finger 68 from its engagement with the washer 69 frees the woven member or basket 22' and enables it to be constricted diametrically or elongated to come into gripping relation with the object as soon as the lever members 52, 53 are raised. The operator thereupon causes the crane to lift the device and as a result of this action the cables 60, 60 pull up on the lever members 52, 52 and 53, 53 until the grip is tight on the object and the object is then lifted from the ground. During this lifting action of the crane and while the device and the object are being raised from the ground, the rod 64 of each control device, by reason of its loose connection with the straps 65 and 66, remains stationary until the collar 63 comes into contact with the washer 69, as is shown in Fig. 6 of the drawings. By reason of this longitudinal shifting of the rod 64 relative to the device, there is provided a space between the lower ring 45 and the member 67 of the control device and the foot or safety member 73 thereof has dropped below the bottom of the object. When the object has been raised a slight distance from the ground, the lever 61 is shifted from the position shown in Figs. 3 and 4 of the drawings to the position shown in Figs. 5 to 7, to bring the foot or safety members 73 to a radial position beneath the bottom end of the object. Thus the foot members 73 are placed in a position to prevent the object from dropping free of the device should any failure or accident occur. For example, without the safety mechanism, it is possible that the grip of the device might be accidently released if the bottom ring 45 came to rest momentarily against some protruding object during the lifting action and let the object fall clear of the device. With the safety mechanism, however, the drop of the object would be stopped as soon as it came into contact with the foot members 73, 73, a distance of only a fraction of an inch, thereby effectively preventing any damage whatsoever. The associated springs 76, 76 will maintain the foot members 73, 73 in this position until they are positively removed therefrom by the operator.

With the foot members 73, 73 in proper safety position beneath the object, the device with the object is then moved to the place where it is to be discharged. At the place of discharge and when the device has been lowered to a position a few inches from the ground, the operator moves the levers 61 from the safety lock position back to the position illustrated in Fig. 4 of the drawings. On further lowering of the device the foot members 73, 73 first come into contact with the ground which stops their movement and as the device is further lowered, the lower ring 45 comes to rest against the upper ends of the elongated collar members 67. The weight of the levers 52 and 53 during this portion of the operation, however, causes them to keep dropping down until the tops of the straps 54 and 55 hit against the top ring 40. Thus the device, by its own weight, causes the basket or gripping member 22' thereof to expand and automatically releases itself from the object. The safety control mechanism is now in the position illustrated in Fig. 4 of the drawings with the lever 61 in the full line position. To remove the device from the object, the operator now only has to push the levers 61 downwardly to the dotted line position, thereby bringing the fingers 68 thereof into contact with the washers 69 to lock the basket 22' in its expanded condition. The crane or hoist can thereupon be operated to raise the device from the object and bring it back into position to lift another object.

In the event that the grip during the transporting of the object has been accidently released so that the object is caused to be dropped upon the foot or safety members 73, 73, it will be evident that such members cannot be moved out from under the object, as has been above explained, as a portion or all of the weight of the object is being supported by them. To pivot such members out of safety lock position in order to remove the device from the object, it is necessary for the crane to set the device and the object on the ground. Then the device and object as a unit may be readily tilted at an angle to permit the control mechanism to be operated to bring them to the condition shown in Fig. 4 of the drawings with the levers 61 in the dotted line position shown in such figure. The two safety mechanisms are preferably so constructed so that the levers 61 move in directions opposite to each other. That is, the lever 61 and foot or safety member 73 of each mechanism will be moved in opposed relation to the corresponding members of the other mechanism. It will, of course, be apparent that where the device is to be used for lifting lighter objects or objects which in themselves are not dangerous, the device need be provided with only one control and safety mecha-

nism instead of two, as is illustrated in the drawings.

Instead of utilizing a lever arrangement to extend the basket or woven gripping member into tight gripping relation with the object, the same purpose can be accomplished by the use of pulleys. A construction of this type is illustrated in Fig. 12 of the drawings, in which the upper ring, the basket or gripping member and the bottom ring of the device are designated by the reference numerals 80, 81 and 82, respectively. Secured at their lower ends to the bottom ring 82 are a pair of diametrically opposed longitudinally extending bars or compression members 83, 83 which extend upwardly through straps 84, 84 provided on the upper ring 80 and project above such ring. The upper ends of the members 83, 83 are each provided with an offset portion to which is connected one end of a rope or wire 85. The rope 85 connected to the upper end of each member 83 passes downwardly beneath a pulley wheel 86 rotatably mounted on a pin supported by the strap 84 and ring 80 and thence upwardly to a supporting member 87 secured to the bottom end of the lifting cable 88. It will thus be seen that any pull exerted on the cable 88 will exert a pull on the wires or ropes 85, 85 and through the latter and the compression members 83, 83 will exert a force in the opposite direction upon the bottom ring 82 and consequently the woven gripping member 81. The grip will be thus extended to exert a gripping action on the object being lifted by an amount proportional to the force required to lift the object. The advantage of this construction is that the limits to which the device can be extended and contracted are greater than with the leverage constructions because of the free movement of the pulleys and the greater possible length of the compression members 83, 83. Thus the range of diameters which can be gripped with this design is relatively greater than obtainable by use of the above described leverage design.

In Figs. 13 and 14 of the drawings, there is illustrated another form of leverage design which may be especially advantageous for certain purposes. In this construction, the bar-like compression members are replaced by a tubing 90 which encloses the top ring 91, the woven gripping member 92 and the bottom ring 93, the latter of which is secured to the lower end of the tubing 90 in any suitable fashion, while the top ring 91 is free to move relative to such tubing 90. Pivotally mounted on brackets 94, 94 provided on the upper end of the tubing 90 in diametrically opposed relation are two lever members 95, 95. Each of the lever members 95 is provided with a toothed portion 96 adapted to engage beneath the upper ring 91 and a curved upper portion 97 adapted to engage with the associated bracket 94. Thus, by pressing the levers 95, 95 towards the tubing 90, the portions 96 thereof will, through their engagement with the upper ring 91, cause the woven gripping member to be extended longitudinally away from the lower ring 93 and cause it to tightly grip an object inserted therein. When the levers 95, 95 are pivoted in the opposite direction, the gripping action of the device will be broken, the portions 97 of such levers coacting with their associated brackets 94 to limit the outward movements of the levers. This construction has special advantages where it is desirable not only to securely grip the object but by securely holding the tubing 90 against rotation, preventing any rotational movement of the object.

Instead of using top and bottom rings in the pulley construction shown in Fig. 12 of the drawings, the woven gripping member may be provided at each end with a plurality of loops. A construction of this type is shown in Fig. 15 of the drawings, in which construction the wires of the woven gripping member 100 are at each end of the member formed into two loops 101 and 102. The loops 101 and 102 at the bottom end of the device have connected thereto the lower ends of the compression bars 103, 103, while the loops 101 and 102 at the upper end of the device have connected thereto the pulleys 104, 104. In other respects this construction is substantially similar to the construction shown in Fig. 12 of the drawings so that its operation need not be gone into in detail. It should be pointed out, however, that the advantages of the construction shown in Fig. 15 of the drawings are that it makes possible a greater range of expansion and contraction of the woven gripping member and makes it possible to effectively grip objects having a relatively small diameter. Thus the woven structure may be made of relatively small wires and yet by reason of the tremendous forces which can be exerted through the expansion and contraction mechanism, the device can grip the object securely and without any danger of failure. It will be evident also that this form of the invention can be further modified by providing eyes or rings for the loops 101 and 102 and threading the ropes or wires 106, 106 through such eyes or rings instead of using pulley wheels. Also, any number of pulleys or rings may be used as is practical and desirable in order to more evenly distribute the pulling forces to the woven gripping member 100.

It will also be obvious to those in the art that many other changes and modifications may be made in the constructions illustrated in the drawings and hereinabove described without departing from the spirit of the invention or the scope of the appended claims, hence I do not wish to limit myself specifically to such constructions.

I claim:

1. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, rigid means connected to a portion of said unit and extending longitudinally of the same, and means connected to said rigid means and to said unit at a place spaced from the first mentioned connection of said rigid means with said unit and operable through said rigid means to extend said unit and thereby to contract the same.

2. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, rigid means connected to a portion of said unit and extending longitudinally of the same, and lever means connected to said rigid means and to said unit and operable upon said rigid means to cause an extension of said unit in a longitudinal direction.

3. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, rigid means connected to a portion of said unit and extending longitudinally of the same, force transmitting means connected to said rigid means

and to a portion of said unit spaced from the portion of such unit to which said rigid means is connected, said last mentioned means being operable through said rigid means to cause an extension of said unit in a longitudinal direction.

4. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, rigid means connected to a portion of said unit and extending longitudinally of the same, lever means pivotally mounted on portion of said unit spaced from the portion of such unit to which said rigid means is connected and being connected to said rigid means, said lever means and rigid means being operable to cause an extension of said unit in a longitudinal direction.

5. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, a rigid member extending longitudinally of said unit and a movable member connected to said rigid member, said rigid and movable members being connected to spaced portions of said unit and operable to cause an extension of said unit in a longitudinal direction.

6. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, rigid means connected to a portion of said unit and extending longitudinally of the same, pulley means mounted on portion of said unit spaced from the portion of such unit to which said rigid means is connected and being connected to said rigid means, said pulley and rigid means being operable to cause an extension of said unit in a longitudinal direction.

7. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, a plurality of rigid members connected at one end to a portion of said unit, a plurality of levers pivotally mounted on portion of said unit spaced from the portion of such unit to which said rigid members are connected and being connected to the other ends of said rigid members, said levers and rigid members being operable to extend said unit in a longitudinal direction.

8. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, means connected to longitudinally spaced portions of said unit and operable to extend said unit in a longitudinal direction, and control means operable to maintain said unit in a contracted condition until released.

9. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, means connected to said unit and operable to extend the same in a longitudinal direction, and control means including a safety member adapted to be moved into position beneath an object held by said unit.

10. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, means connected to said unit and operable to extend the same in a longitudinal direction, and control means including an operating lever at one end of said unit and a safety member at the other end of said unit, means operatively connecting said lever and safety member and adapted upon operation of said lever to move said safety member into position beneath an object held by said unit.

11. The combination defined by claim 10, in which said connecting means includes a longitudinally extending rigid member and in which said operating lever is pivotally mounted on said rigid member, and means operable by said lever for controlling the longitudinal extension of said unit.

12. The combination defined by claim 10 including means to limit the range of movement of said operating lever and safety member and means to maintain said lever and member in an adjusted position until positively removed therefrom.

13. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, a rigid ring secured to each end of said unit, rigid means connected to the lower of said rings and extending upwards from the same towards said other ring, lever means pivotally mounted on said other ring and connected to said rigid means, said lever means and said rigid means being operable to increase the distance between said rings and to elongate said unit.

14. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, rigid means connected to one end of said unit and extending longitudinally of the same to a point beyond the other end thereof, flexible means secured to the projecting portions of said rigid means and movably connected to the adjacent end of said unit, said flexible means being operable through said rigid means to elongate said unit.

15. The combination of an expansible and contractile unit composed of a plurality of strands arranged about a common axis to form a tubular structure adapted to receive an object to be held, means connected to said unit and operable to extend the same in a longitudinal direction thereby causing a tight gripping of the unit on an object, and an interior lining in said unit, said lining being composed of flexible material having high frictional characteristics and adapted to increase the frictional grip of the unit on the object.

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