

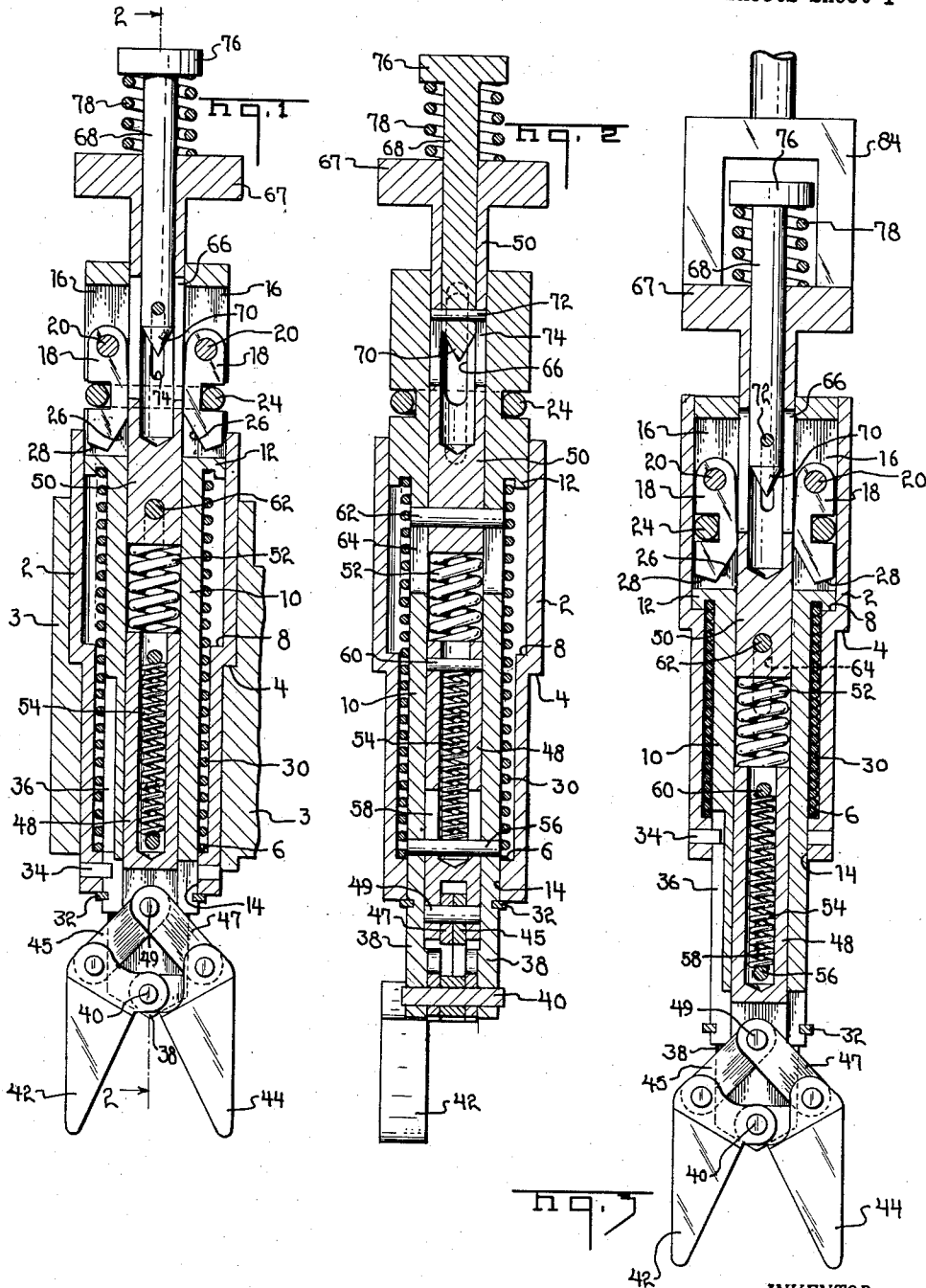
June 18, 1963

G. H. SCHWALM
HANDLING DEVICE

3,094,349

Filed April 3, 1961

2 Sheets-Sheet 1



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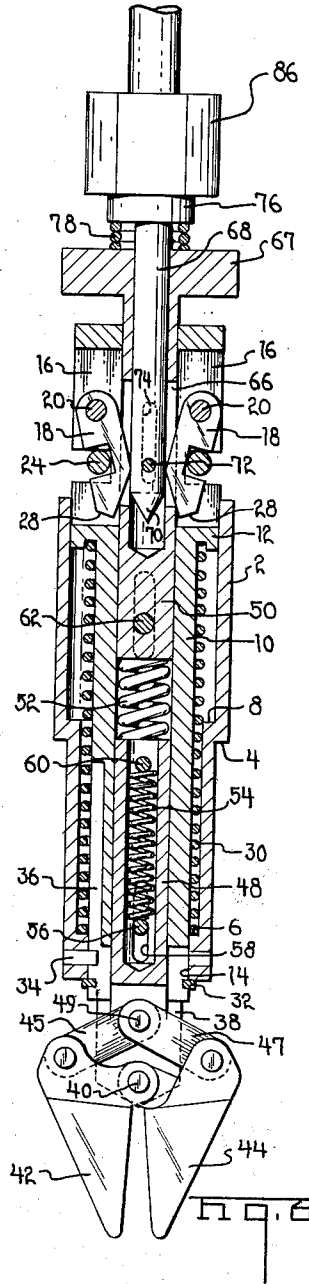
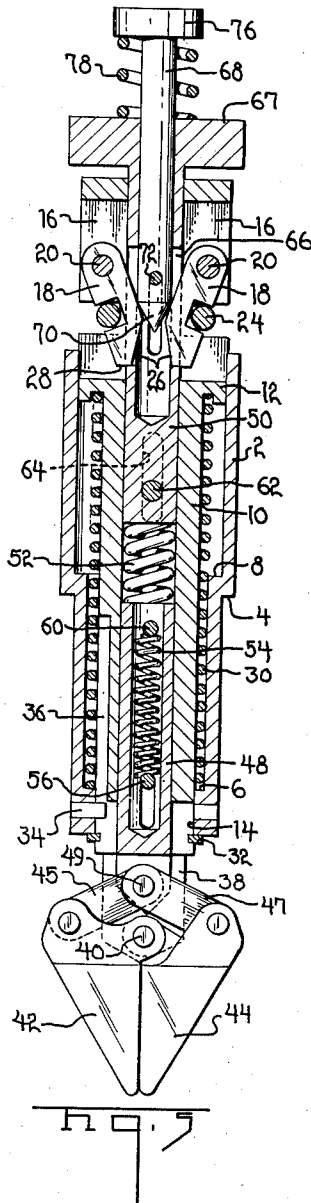
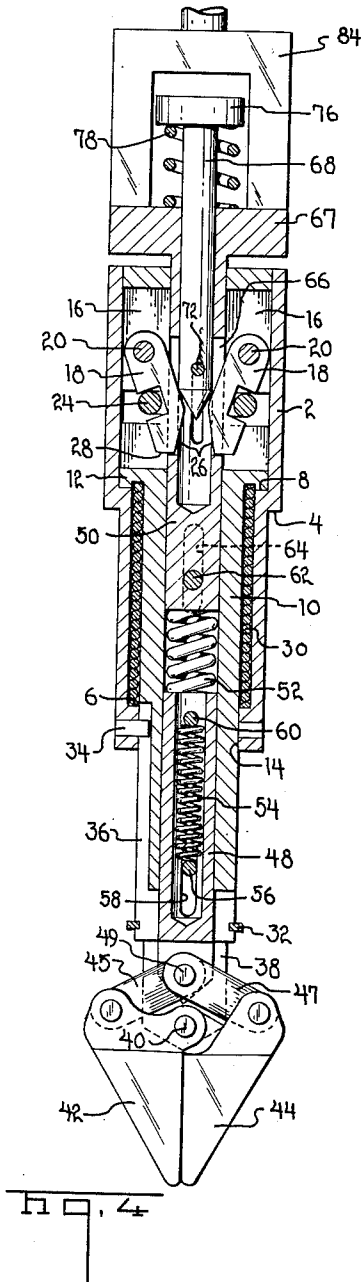
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HANDLING DEVICE

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9 Claims. (Cl. 294-115)

This invention relates to handling devices of a type adapted to engage and pick up material or articles upon reception of a first momentary stimulus and to release the articles or materials in response to a second stimulus. The invention is herein disclosed in the embodiment of a wire holding device particularly intended for usage on a wire handling and stacking apparatus as disclosed in the copending application of Glendon H. Schwalm et al., Serial No. 100,340, filed April 3, 1961, now Patent No. 3,062,390. However, the invention is obviously amenable to alternative uses as will be apparent upon a reading of the following specification.

It is an object of the invention to provide an improved holding or handling device for materials or articles which is responsive to external actuation to pick up, hold, and release the material or article being handled. A further object is to provide a handling device having material or article holding means which can be closed or opened upon reception of an actuating force, the direction of the actuating motion being received from the same direction for both closing and opening the holding means. A still further object is to provide a handling apparatus in which the holding jaws or their equivalents are closed upon application of a single instantaneous actuating stroke of an external device and the jaws remain closed until application at a later time of a single actuating stroke.

These and other objects of the invention are achieved in a preferred embodiment comprising an axially hollow sleeve having wire gripping jaws pivotally mounted on one of its ends. A control shaft is slidably mounted within this sleeve and has, on one of its ends, a linkage to the wire gripping jaws so that upon movement of this shaft from a retracted position to an extended position, the jaws are closed while reverse movement of the shaft causes the jaws to open. Latch means provided on the sleeve are engageable with the control shaft upon movement thereof from its retracted to its extended position to hold it in the latter position and to maintain the jaws in the closed condition. The shaft itself is axially hollow and has a latch release rod disposed therein which is engageable with the above-mentioned latch means to release the shaft from its latch engagement with the sleeve and to permit the jaws to open. In a preferred embodiment the entire structure as described thus far is mounted within a housing which in turn is mounted on a conveyor and is adapted to pick up and hold wires or other filamentary devices during movement of the conveyor.

In the drawing:

FIGURE 1 is a sectional view of the preferred embodiment showing the parts in their normal positions and with the jaws open.

FIGURE 2 is a sectional view looking in the direction of the arrows 2—2 of FIGURE 1.

FIGURE 3 is a view similar to FIGURE 1 but showing the sleeve and jaws lowered with respect to the housing preparatory to the picking up of a wire.

FIGURE 4 is a view similar to FIGURE 3 but showing the jaws in their closed positions.

FIGURE 5 is a view showing the jaws in the closed position but with the parts otherwise in their normal positions and illustrates the positions of the parts while the wire is being held.

FIGURE 6 is a view illustrating the opening of the jaws and the release of the wire.

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The reference numeral 2 denotes a generally cylindrical housing which is mounted in a block 3. The block is, in turn secured to a conveyor (not shown) so that wires or the like can be picked up at one station along the path of the conveyor, transported to a second station and released at the second station. Housing 2 has an external shoulder 4, a lower internal shoulder 6, and an upper internal shoulder 8 intermediate its ends. The hollow interior of the housing is thus divided into an upper portion which is of a relatively larger diameter than the lower portion below the shoulder 8. An axially hollow sleeve 10 is slidably mounted within the housing and has an enlarged upper end 12 which bears against the interior surface of the upper portion of the housing. The lower end of this sleeve extends through and bears against a reduced diameter opening 14 in the lower end of the housing so that the sleeve assembly is axially guided within the housing during downward movement with respect thereto. The enlarged upper end of the sleeve is provided with diametrically opposite radial slots 16 within which pawl members 18 are mounted on pivot pins 20. A circular spring 24 is positioned within a circumferential groove in the enlarged upper end of the sleeve and normally biases these pawls inwardly of the sleeve and against a control shaft section 50 referred to and described below. The lower ends of the pawls have edges 26 which diverge from the sleeve axis while the ends of the pawls have reversely extending edges 28 which serve as a locking means as will be described below.

Sleeve 10 is normally biased to the position shown in FIGURE 1 by means of a coil spring 30 which surrounds the sleeve and is interposed between the enlarged upper end 12 thereof and the internal shoulder 6 of the housing. The entire sleeve assembly can be moved downwardly, as shown in FIGURE 3, against the force of this spring until the enlarged upper portion of the sleeve engages the internal shoulder 8 of the housing. Advantageously, the snap ring 32 is provided on the sleeve adjacent its lower end to prevent it from moving upwardly beyond the position shown in FIGURE 1. It is also desirable in some instances to prevent rotation of the sleeve relative to the housing and in the disclosed embodiment this is achieved by means of a keyway 36 in the sleeve which receives a key or pin 34 in the housing.

A pair of spaced-apart ears 38 extend from the lower end of sleeve 10. A pin 40 extending between these ears serves a common pivotal mounting for a pair of wire-gripping jaws 42, 44. The opening and closing of these jaws is controlled by links 45, 47 which are each pivoted at one end to one of the jaws and at their opposite ends to a common pivot pin 49 on the lower end of the lower control shaft section 48. This lower shaft section is slidably mounted within sleeve 10 as is the upper shaft section 50, a relatively stiff coil spring 52 being interposed between the two shaft sections. The shaft sections are normally biased upwardly to the positions shown in FIGURE 1 by means of a coil spring 54 mounted within the hollow lower shaft section 48 and effective between a first pin 56 in sleeve 10 and a second pin 60 in shaft section 48. The pin 60 is secured in the lower shaft section and the pin 56 is secured in the sleeve, a slot 58 being provided in the lower shaft section to permit it to move with respect to the sleeve 10. The upper shaft section 50 also has a pin 62 therein which extends into slots 64 in the sleeve 10 thereby to retain the upper shaft section in the sleeve while permitting relative movement of this upper section with respect to the sleeve.

The upper shaft section 50 has a bore extending axially inwardly from its upper end and is slotted as shown at 66, the slots 66 being circumferentially aligned with the previously described slots 16. When the parts are in the posi-

tions of FIGURE 1, the pawl members 18 bear against the upper shaft section 50 at a location below the limits of the slots, however, upon downward movement of the shaft, the pawls move inwardly and into slots 66 under the influence of spring member 24 until the edges 28 of the pawls latch the shaft in its relatively extended or lowered position with respect to the sleeve. Thus, it will be apparent that the jaws can be closed by pressing downwardly on the enlarged upper end or head 67 of the upper shaft section 50.

A latch release rod 68 is slidably received within the bore in upper shaft section 50, the limits of its movement being controlled by a pin slot connection 72, 74 between these two parts. The lower end of this rod is conical as shown in 70 so that it will engage and cam the pawls 18 radially outwardly when it is moved downwardly relative to the shaft. The upper end of this latch release rod also has an enlarged end or head 76, the diameter of this head advantageously being somewhat smaller than the diameter of the head 67 of the upper shaft section. A coil spring 78 is interposed between the underside of latch release rod 76 and surface 67 of the upper shaft section normally to bias the rod upwardly to the position shown in FIGURES 1-5.

For best results the springs 30, 54, 52 and 78 must be selected with some care as regards their stiffnesses. The spring 30 should be only sufficiently stiff to bias the sleeve to the position of FIGURE 1 against the force of friction and the weight of the sleeve, shaft sections and the control rod. The spring 54 should be relatively more stiff (i.e. have a higher spring constant) than spring 30 so that upon application of a downward force on the shaft head 67, the spring 30 will yield prior to yielding of the spring 54. The spring 52 should be relatively stiff and should not yield appreciably until spring 54 is compressed by a downward force on the shaft head. The spring 78 should be relatively weak as should the circular spring 24 although the stiffness of springs 78 and 24 is not as important as the previously mentioned springs. The importance of a judicious selection of these springs will be apparent from the description of the operation of the device which follows.

At the outset the parts are in the position of FIGURE 1 with the jaws 42, 44 open and with both the sleeve 10 and the shaft 48, 50 in their upper positions. The sleeve 10 and the shaft 48, 50 are first lowered to the position of FIGURE 3 to position the jaws on each side of the wire. This lowering of the jaws is achieved by pressing on the upper surface 67 of the upper shaft section by means of a suitable depressing device 84 which is actuated from an external source such as a solenoid. During this phase of the operation the spring 30 yields while the spring 54 remains substantially uncompressed so that the positions of the sleeve and the shaft do not change with respect to each other. The depressing device 84 then continues to move downwardly and the spring 54 is compressed with concomitant downward movement of the shaft sections with respect to the sleeve. During this interval links 45, 47 are straightened (FIGURE 4), the jaws closed, and the slots 66 are lowered until the pawls 18 are permitted to move inwardly until their edges 28 engage the lower edges of these slots. In this manner the shaft 48, 50 is latched in its lowered position with respect to the sleeve and the jaws are maintained in the closed condition of FIGURE 4. After the jaws have been closed about the wire, the depressor 84 is disengaged from the sleeve and the entire sleeve-shaft assembly rises (FIGURE 5) until snap ring 32 bears against the lower end of the housing. It is while the parts are in the position of FIGURE 5 that the wire is transported from a first station to a second station.

Upon arrival at the second station, a depressor 86 is brought to bear against the enlarged head 76 of the latch-release rod and this rod is pressed downwardly until its conical end cams the pawls 18 out of engagement with

the lower end of the slots 66. Upon such movement of the pawls, the shaft sections 48, 50 are free to return upwardly to their retracted position under the influence of spring 54 which was previously held in the compressed condition of FIGURES 4 and 5. FIGURE 6 shows the beginning of this upward movement of the shaft and the initial opening of the jaws. In order to achieve this motion, spring 54 must be capable of overcoming spring 78.

It should be pointed out that the shaft sections 48, 50 can be made integral with each other if desired and the structure will be somewhat simplified as compared with the disclosed embodiment. The two-part shaft with the interposed spring 52 is employed in order to ensure delicate handling of the wires. The spring 52 acts as a shock absorber so that when the jaws close on the wire, the spring will yield after the wire has been firmly gripped and the jaws will not move further. This prevents the insulation of the wire from being tightly pinched between the jaws and possibly damaged. Obviously with some other types of materials, the spring 52 would not be required and the two shaft sections could therefore be made integral. It should also be noted that under some circumstances the external housing 2 can be dispensed with if it is not necessary that the entire jaw assembly and the shaft and sleeve be lowered to pick up the article or material. The pin and keyway aligning means 34, 36 between the housing and the sleeve is also required in the disclosed embodiment in order to ensure that the jaws will be properly aligned with respect to the wire. Again, this feature can be eliminated under some conditions if alignment of the jaws or their equivalent is not essential.

In FIGURE 6 the sleeve-shaft sub-assembly 10, 48, 50 is shown in its retracted position although the latch release rod is depressed relative to these parts. It will be apparent, however, that if spring 30 is relatively weaker than either spring 78 or spring 24, the spring 30 will be partially compressed and the sleeve-shaft assembly will be moved downwardly somewhat prior to release of the pawls from the sleeve. This downward movement is desirable if it is preferable to release the article held by the jaws at a level lower than their normal level. Under other circumstances it may be a matter of no significance whether the sleeve-shaft assembly is lowered or not. In any event, this movement of the sleeve and lowering of the jaws can be obtained or not, as desired, by a careful selection of the springs 78, 24 and 30.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective against the prior art.

I claim:

1. A holding device comprising, a sleeve, closable holding means on one end of said sleeve, shaft means slidably mounted in said sleeve, means acting between said holding means and said shaft means to close said holding means upon movement of said shaft means from a retracted position, relative to said sleeve, to an extended position, resilient means acting between said sleeve and said shaft means normally to bias said shaft means to said retracted position, latch means effective between said shaft means and said sleeve to latch said sleeve in said extended position, and latch release means in said shaft means to disengage said latch means and permit opening of said holding means under the influence of said resilient means.

2. A holding device comprising, a sleeve, a pair of jaws pivotally mounted on said sleeve at one end thereof, a shaft slidably mounted in said sleeve, a pair of links pivotally connecting one end of said sleeve with said jaws whereby, upon movement of said shaft from a retracted

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position to an extended position said jaws are closed, spring means effective between said shaft and said sleeve normally to bias said sleeve to said retracted position, latch means effective between said shaft and said sleeve to latch said sleeve in said extended position, and latch release means in said shaft and engageable with said latch means to disengage said latch means and permit opening of said jaws under the influence of said resilient means.

3. A holding device comprising, a sleeve, a pair of jaws pivotally mounted on said sleeve at one end thereof, a shaft slidably mounted in said sleeve, a pair of links pivotally connecting one end of said sleeve with said jaws whereby, upon movement of said shaft from a retracted position to an extended position said jaws are closed, spring means effective between said shaft and said sleeve normally to bias said sleeve to said retracted position, latch means effective between said shaft and said sleeve to latch said sleeve in said extended position, and latch release means in said shaft and engageable with said latch means to disengage said latch means and permit opening of said jaws under the influence of said resilient means, the end of said sleeve opposite to said one end having an enlarged head for engagement by an external device to move said sleeve from its retracted position to its extended position, and said latch release means extending beyond said enlarged head and being engageable by an external device for movement thereof into engagement with said latch means.

4. A holding device comprising, a sleeve, a pair of jaws pivotally mounted on said sleeve at one end thereof, a shaft slidably mounted in said sleeve, a linkage connecting one end of said sleeve with said jaws whereby, upon movement of said shaft from a retracted position to an extended position said jaws are closed, spring means effective between said shaft and said sleeve normally to bias said sleeve to said retracted position, aligned axially extending slots in said shaft and said sleeve, latch means in said slot in said sleeve, resilient means normally biasing said latch means towards said shaft whereby upon movement of said shaft from its retracted position to its extended position, said latch means engages the edge of said slot in said shaft thereby to latch said shaft in its extended position and to maintain said jaws closed, and a latch release rod slidably mounted in said shaft, said rod normally being out of engagement with said latch but being movable into engagement therewith to release said shaft from latched engagement with said sleeve and to permit retractile movement of said shaft with concomitant opening of said jaws.

5. A holding device comprising, a sleeve, a pair of jaws pivotally mounted on said sleeve at one end thereof, a shaft slidably mounted in said sleeve, a linkage connecting one end of said sleeve with said jaws whereby, upon movement of said shaft from a retracted position to an extended position said jaws are closed, a pin in said sleeve and a slot in said shaft, said pin extending through said slot to permit movement of said shaft relative to said sleeve, a spring in said shaft and effective between said shaft and said pin normally to bias said shaft to its retracted position, aligned axially extending slots in said shaft and said sleeve, a pawl pivotally mounted in said slot in said sleeve, resilient means normally biasing said pawl towards said shaft whereby, upon movement of said

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shaft from its retracted position to its extended position, said pawl engages the edge of said slot in said shaft thereby to latch said shaft in its extended position and to maintain said jaws closed, and a rod slidably mounted in said shaft, said rod normally being out of engagement with said pawl but being movable into engagement therewith to release said shaft from latched engagement with said sleeve and to permit retractile movement of said shaft with concomitant opening of said jaws.

6. A gripping device comprising, a housing, a sleeve slidably mounted in said housing and movable in a first direction from a retracted position to an extended position at which one end of said sleeve extends beyond one end of said housing, a first resilient means acting between said housing and said sleeve normally to bias said sleeve to said retracted position, closable gripping means on said one end of said sleeve, shaft means slidably mounted in said sleeve, one end of said shaft means being connected to said gripping means to cause closing thereof upon movement of said shaft means in said first direction relative to said sleeve and to cause opening of said gripping means upon movement of said shaft means in the opposite direction, said shaft means being in an extended position relative to said sleeve when said gripping means are closed and being in a retracted position relative to said sleeve when said gripping means are open, a second resilient means acting between said shaft means and said sleeve normally to bias said shaft means to said retracted position, latch means on said sleeve and engageable with said shaft means when in its relatively extended position to retain said shaft means in said extended position with said jaws closed, and a latch release rod disposed in said shaft means, said latch release rod being resiliently biased in the direction opposite to said first direction and being movable in said first direction to disengage said latch means from said shaft means, whereby said sleeve is moved to its extended position and said gripping means is closed when said shaft means is moved in said first direction to its extended position and said gripping means is opened upon movement of said rod in said opposite direction.

7. Apparatus as set forth in claim 6 wherein said shaft means is in two parts and including a relatively stiff resilient means interposed between said two parts.

8. Apparatus as set forth in claim 6 wherein said second resilient means comprises a spring in said shaft means and interposed between a pin in said shaft means and a pin in said sleeve extending through an elongated slot in said shaft means.

9. Apparatus as set forth in claim 6 wherein said gripping means comprises a pair of jaws pivotally mounted in said one end of said sleeve, a pair of links each being pivotally connected at one end to said jaws and being pivotally connected at their opposite ends to said one end of said shaft means.

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