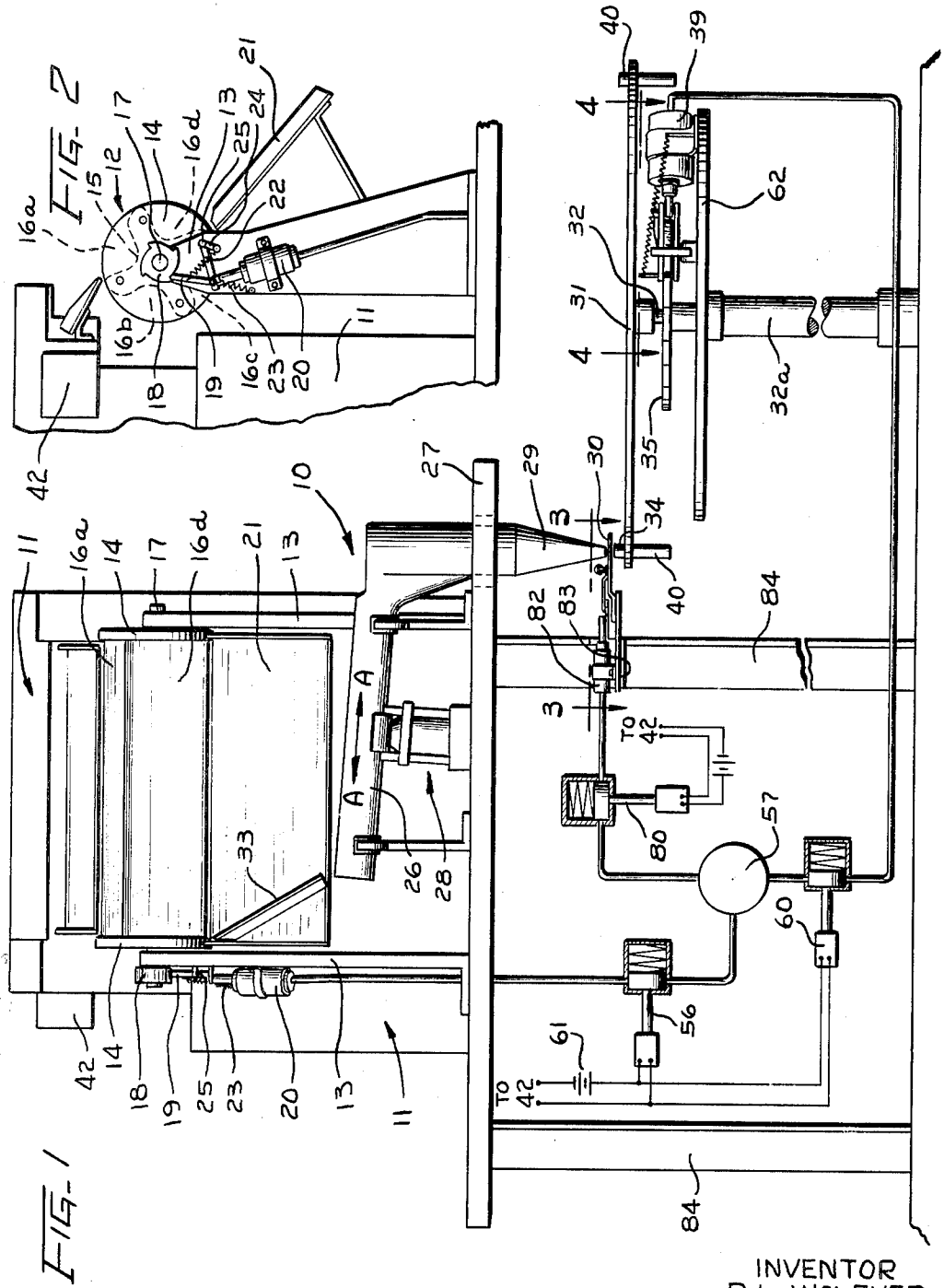
Dec. 7, 1965 D. L. WOLEVER 3,221,471

APPARATUS FOR ORIENTING AND PACKAGING ELONGATED PARTS

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FIG. 3

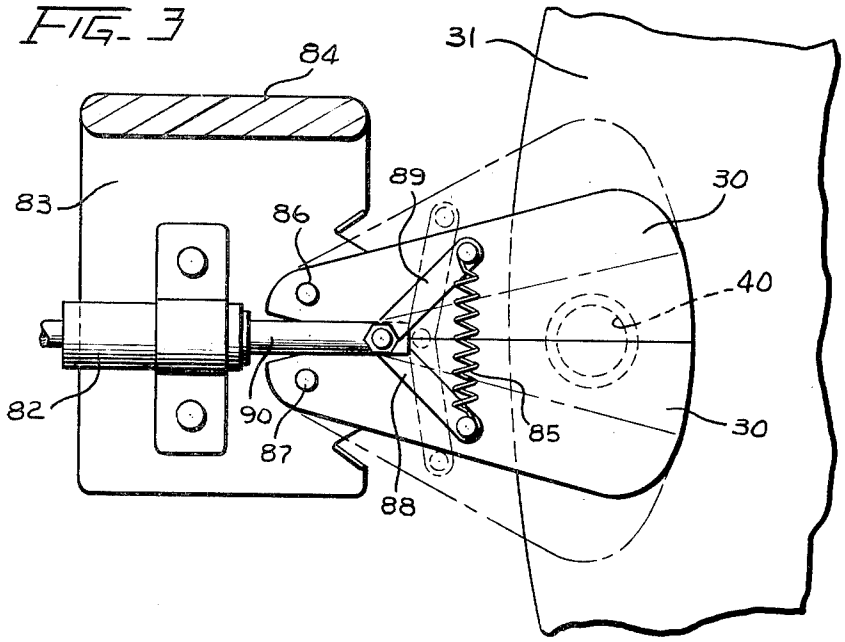
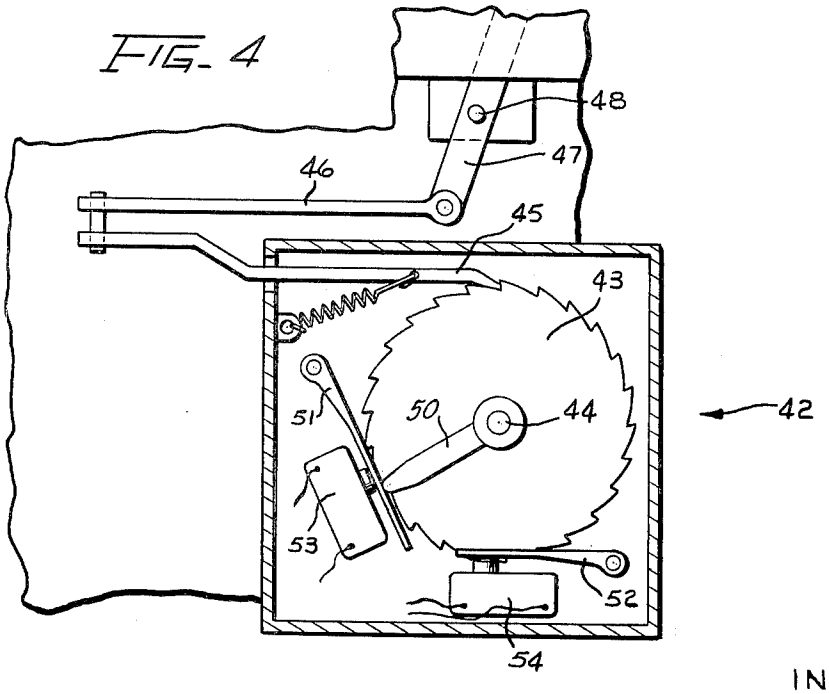



FIG. 4




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FIG. 5

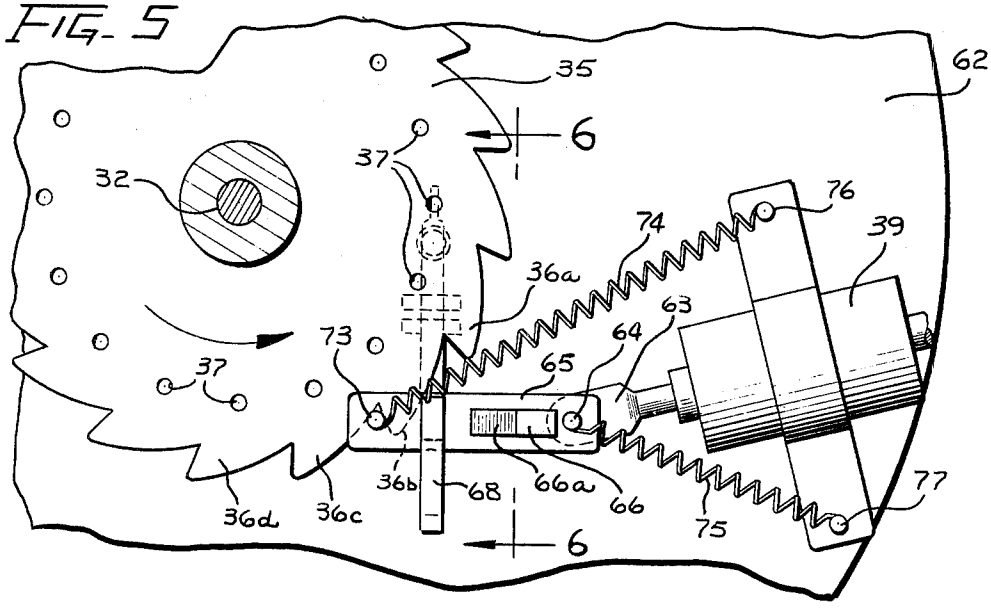
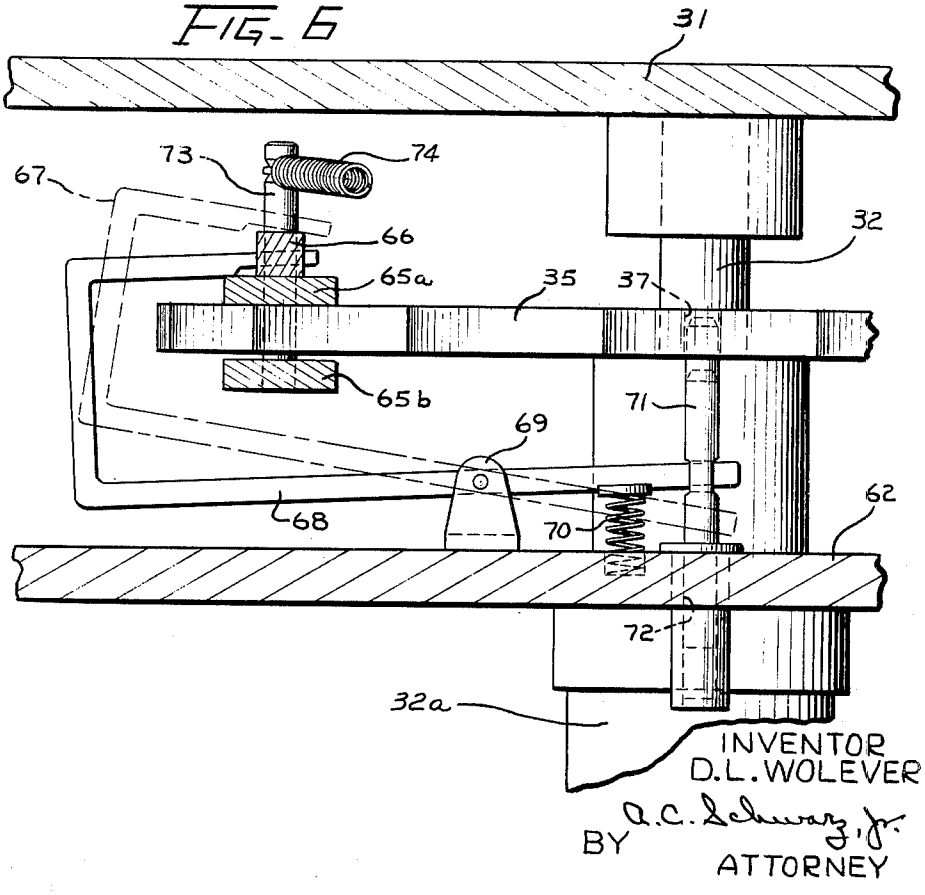



FIG. 6




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# APPARATUS FOR ORIENTING AND PACKAGING ELONGATED PARTS

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4 Claims. (Cl. 53—78)

This invention relates generally to an apparatus for orienting and packaging elongated parts, and more specifically, this invention provides an apparatus for orienting, aligning and packaging lengths of flexible wire as they issue from a conventional wire cutting machine.

Electrical assembling and installing operations, in particular, employ bundles incorporating a number of insulated wires which have the end portions thereof stripped of insulation. Machines are available that will automatically measure, cut and strip one or both of the ends of the insulated wire. Such machines also include a counter mechanism for counting the number of wires cut and stripped. As the cut and stripped wires issue from these machines, they pile up in an unoriented mass in the bottom of the exhaust chute. If a counter is also utilized, the machine will stop after a predetermined number of wires have been cut and stripped as a result of a signal from the counter.

In order to facilitate the selection of individual wires by an assembler, the wires should preferably be presented to the assembler in bundle-form, with the ends of the lengths comprising the bundle in substantial alignment. Present practice requires manual manipulation of the wires until they are oriented with their lengths substantially parallel and their ends aligned. Rubber bands are thereafter placed around the ends of the bundle in order to hold the lengths of wire together.

Sorting and bundling problems arise under present practice when the operator tries to convert the mass of cut wires into bundle-form. The problems of untangling, orienting and aligning the wires are quite bothersome, particularly when the mass consists of a considerable number of flexible lengths. In practice, the operator spreads out the wires on a flat surface and then physically moves each misaligned wire until the end thereof is aligned with the ends of other wires. The operator must then bundle the lengths so that they can be secured together by rubber bands. As will be evident, such a process requires considerable time-consuming attention by the operator.

It is an object of this invention to provide an automatic packaging system which will replace the aforedescribed manual sorting and bundling operation.

Another object of this invention is to provide an automatic packaging apparatus in accordance with the above object for use with conventional wire cutting machines without essentially modifying or changing the structure of the latter.

More specifically, it is an object of this invention to provide an apparatus for receiving cut lengths from a cutting machine and which orients the lengths so received in longitudinal directions, collects the lengths into bundles, aligns the ends of the bundle, and thereafter packages the bundle.

Another object of this invention is to provide a packaging apparatus in accordance with the foregoing object that additionally counts and controls the number of lengths so that the packaged bundle contains only a predetermined number of lengths.

Still another object of the invention is to provide a relatively simple mechanism for periodically indexing a packaging mechanism to a position where a container carried by the packaging mechanism can receive a predetermined number of lengths.



According to this invention, a vibrating chute receives cut lengths of material and is formed with a constricted end portion. The vibration of the chute and the constricted end portion cooperate to respectively orient and compact the lengths into bundle form. A packaging mechanism is positioned to receive bundles of lengths issuing from the constricted end of the chute. A control mechanism is provided to control the number of lengths deposited in the chute, and a closure member is interposed between the constricted end of the chute and the packaging mechanism. The closure member supports and releases bundles in response to signals from the control mechanism so that each bundle contains only a predetermined number of lengths.

Other objects, advantages and novel aspects of the invention will become apparent upon consideration of the following detailed description, in conjunction with the accompanying drawings, in which:

FIG. 1 illustrates the complete pacakaging apparatus constructed in accordance with this invention;

FIG. 2 is an end view of a collector for receiving lengths issuing from a length cutting machine and transferring the lengths received thereby to a vibrating chute positioned therebeneath;

FIG. 3 is a detailed plan view, taken on the line 3—3 of FIG. 1, of the blocking plate which alternately supports and releases a bundle in response to a signal from a control mechanism;

FIG. 4 is a partial side sectional view of the control mechanism for effecting sequential operation of the various stages of the packaging apparatus.

FIG. 5 is a detailed plan view of a mechanism for actuating a package carrying turret; and

FIG. 6 is a sectional end view of FIG. 5 taken through section lines 6—6.

Referring now to FIGS. 1 and 2, there is illustrated the packaging apparatus **10** in combination with a conventional length cutting machine **11** for severing successive sections of insulated wire, stripping the insulation from the ends thereof and discharging the wire sections in a substantially horizontal position. The system **10** includes a rotatable length collector or accumulating device indicated generally by the numeral **12**, which is supported for rotative movement on supports **13** and consists of a pair of end plates **14** and a central core **15** having four substantially U-shaped portions **16***a*, **16***b*, **16***c* and **16***d* which form axially directed recesses or pockets for receiving the lengths therein. Lengths issuing from the machine **11** are received by one of these portions.

The collector **12** is supported by a shaft **17** revolvable in suitable bearings in the supports **13**. Affixed to one extremity of the shaft **17** is a ratchet **18**, which is revolvable in a clockwise direction, FIG. 2, by means of a pawl **19** under the control of a conventional air cylinder **20**. It will be evident that actuation of the pawl **19** effects rotation of the ratchet **18** through 90°, causing any lengths deposited in the depressed portion **16***a* to be thrown or fed therefrom onto a slide plate **21**. A pair of springs **22** and **23** are connected to the pawl **19** and to the support **13**. The spring **22** biases the pawl against the teeth of the ratchet and the spring **23** returns the pawl to the position shown in the figures after actuation thereof. The pawl is guided for movement by a linkage **24** pivotally mounted by a pin **25** to the support **13**.

A semi-circular inclined chute **26** is placed at the bottom of the plate **21** to receive the lengths and is mounted on a table **27** in such a manner that it may be vibrated in the directions indicated by arrows A—A by a commercial vibrator indicated generally by the numeral **28**.

The vibrator can be driven electrically, hydraulically, or otherwise. As may be seen in FIG. 1, the chute **26** is positioned at an angle with respect to the table **27** and when vibrated by the vibrator **28** causes the lengths deposited therein to move toward the right or down the chute. An L-shaped rod **33** is secured at an angle to the plate **21** and serves to pivot the lengths so that the ends thereof slide properly into the chute **26**.

The walls of the chute **26** taper inwardly and finally terminate as a funnel-shaped end **29**. The lower opening of the end **29** is normally blocked by a pair of plates **30** mounted therebeneath. The vibrating motion of the chute **26** serves to longitudinally orient the lengths during travel thereof towards the end **29**.

A turret **31** is rotatably mounted under the plates **30** on a shaft **32** and is so positioned that a plurality of apertures **34** (FIG. 1) equi-spaced in a circle near the periphery thereof may be presented successively below the opening in the end **29**. A standard **32***a* supports the shaft **32** for rotative movement. Secured to the shaft **32** is a ratchet **35** (FIGS. 1, 5 and 6) having a predetermined number of teeth, four of the teeth being designated by the numerals **36***a*, **36***b*, **36***c* and **36***d*. These teeth are spaced adjacent the periphery thereof and are equal in number to a number of equi-spaced holes **37** (FIG. 5). The holes **37** are equal in number to the number of apertures **34**, and are spaced in a circle concentric with the axis of the ratchet **35**. The ratchet **35** indexes the turret **31** by means of a pawl **38** under the control of an air cylinder **39** of conventional type.

Referring now to FIG. 1, a plurality of tubes, indicated generally by the numeral **40**, are provided, one in each of the apertures **34**. The tubes **40** have an open upper end, a closed lower end, and an enlarged portion along the length thereof which serves to overlay the turret **31** and support the tubes within the apertures. The tubes may be of the type disclosed in U.S. Patent No. 2,881,947 issued to W. M. Hancock and assigned to Western Electric Company, Inc.

The operation of the apparatus **10** is such that after a predetermined number of cut lengths are collected in depression **16***a* in the collector **12**, the collector will be rotated clockwise 90° to throw the lengths onto the plate **21** down which they fall by gravity into the enlarged end of the chute **26**. The vibrator **28** acting against the chute **26** will vibrate and thereby advance and orient the lengths until the lengths fall into the end **29** where they are ultimately supported by the plates **30** in compacted bundle-form. Upon separation of the plates **30**, the bundle is released and falls from the end **29** into one of the tubes **40**. Thereafter, the plates **30** will close and the turret **31** will be stepped or indexed to present a succeeding tube **40** below the end **29**.

In order to achieve the above sequential operations, a control mechanism or timing device, indicated generally by the numeral **42** in FIG. 4, is provided. The mechanism **42** consists of a counting gear **43** mounted on a shaft **44** for rotation by a pawl **45**. The pawl **45** is interconnected with an arm **46** which in turn is connected to one end of a lever **47** pivotally connected to the machine **11** by a pivot pin **48**. The other end of the lever **47** is connected to one of the material cutting blades (not shown) of the machine **11** so that every time the machine **11** cuts a length, the lever **47** will be pivoted. The lever **47** acting through the arm **46** and the pawl **45** will cause the gear **43** to be rotated the distance of one tooth in a clockwise direction, the gear **43** being indexed the distance of one tooth as each length exhausts from the machine **11**.

The gear **43** has a contact operating arm **50** secured for movement therewith and upon rotation thereof the extremity acting through either an arm **51** or an arm **52** actuates switches **53** or **54**, respectively. The switch **53** is connected in circuit with an air solenoid (FIG. 1), generally referred to by the numeral **56**, the solenoid acting to switch air from a pressurized air source **57** into the cylinder **20** (FIG. 1) every time the contact operating arm **50** depresses and thereby closes the switch **53** (FIG. 4). Actuation of a piston (not shown) in the air cylinder **20** causes the pawl **19**, FIG. 1, to rotate the ratchet **18** clockwise 90° to throw the lengths deposited in the portion **16***a* onto the plate **21**.

The lengths fall initially into the widest portion of the chute **26** and are oriented and caused to travel the length of the chute **26** until they slide in compacted bundle-form into the end **29** with their lower ends abutting the plates **30** which are closed. As more lengths exhaust from the machine **11**, the counting gear **43** will be rotated in step-by-step manner. Succeeding cut lengths are exhausted into the succeeding depression **16***b* now presented to the exhaust of the machine **11**.

The closure of the switch **53** by the operating arm **50** will simultaneously effect actuation of the air solenoid **60** (FIG. 1) since the solenoids **56** and **60** are connected in parallel with the switch **53**. A battery **61** provides a power source for energizing both solenoids which are of a commercial type. Upon energization of the solenoid **60**, pressurized air is received by the air cylinder **39**.

Referring now to FIG. 5, the air cylinder **39** is shown mounted to the standard **32***a* by means of a plate **62**. A rod **63** driven by a piston (not shown) in the cylinder **39** is pivotally connected by a pin **64** to a pawl **65**. The pawl **65** (FIG. 6) comprises a pair of spaced-apart rectangular plates **65***a* and **65***b* connected together by pins **64** and **73**, respectively. A cam **66** having an inclined surface **66***a* tapering from right to left as shown in FIG. 5 is affixed to the plate **65***a* and is designed to move under and engage an end **67** of an L-shaped lever **68** pivotally mounted to the plate **62** at **69** (FIG. 6). A spring **70** biases the lever **68** counterclockwise, as viewed in FIG. 6. A blocking pin **71** is aligned perpendicularly with the circle formed by the centers of the holes **37** and is pivotally connected to the end of the lever **68**. The distance between successive holes is substantially equal to the distance between sucessive teeth on the ratchet **35**. The spring **70** urges one end of the pin **71** into a hole **37** presented above the pin. A bore **72** in the plate **62** accepts the opposite end of the pin **71** for sliding movement therein. When the pin is inserted into a hole **37**, the end portion remaining in the bore **72** serves to connect the ratchet **35** to the stationary plate **62** thereby locking the ratchet against further rotation.

In order to release the ratchet **35**, the cam surface **66***a* must move under the grooved end **67** of the lever **68** to wedge and thereby pivot the lever clockwise to the dotted line position shown in FIG. 6. Since the cam **66** tapers to a pointed edge and since the end **67** is spaced from the plate **65***a*, the pointed edge thereof will not be blocked by the end **67**. The inclined surface **66***a* will drive the end **67** clockwise upon further movement of the pawl **65** to the left, FIG. 5. Rotation of the ratchet **35** is achieved by the portion of the pin **73** that extends between the plates **65***a* and **65***b*. Coil springs **74** and **75** are respectively affixed to the ends of the pins **73** and **64** and to the ends of the pins **76** and **77** fixed to, and extending from, the plate **62**. The springs **74** and **75** guide the pawl **65** during movement thereof and also serve to retract the pawl to the position shown in FIG. 5.

When the air cylinder **39** is actuated by the solenoid **60**, the rod **63** drives the pawl **65** to the left, as viewed in FIG. 5, thereby causing the pin **73** to ride along the edge of the tooth **36***c*. As the pin **73** reaches the apex of the tooth **36***c*, the cam **66** has moved sufficiently under the lever end **67** to tilt the lever until the pin **71** is almost completely withdrawn from the hole **37**. Complete withdrawal of the pin **71** occurs after the pin **73** has moved between the teeth **36***c* and **36***d* and against the face of the tooth **36***c*.

Since the ratchet **35** is now released for rotation, upon subsequent deenergization of the solenoid **60** by the switch

53, the springs 74 and 75 will retract the pawl 65 and the pin 73 causing the ratchet to be indexed the distance of one tooth. Upon retraction of the pawl 65, the cam 66 will also be retracted to its initial position substantially as shown in FIG. 5 releasing the end 67 of the lever 68 so that the spring 70 (FIG. 6) can drive the pin 71 into a succeeding hole 37 in the ratchet 35.

As the counting gear 43 is further rotated to the position where the contact operating arm 50 through the arm 52 closes the switch 54, an air solenoid 80, FIG. 1, will be energized by the source 57 to switch pressurized air into an air cylinder 82. The air cylinder 82 is secured to a flange 83 extending from a table support 84. The plates 30 (FIG. 3) are pivotally connected by pins 86 and 87 to the flange 83. A piston rod 90 of the air cylinder 82 has a pair of arms 88 and 89 pivotally mounted to the end thereof. Opposite extremities of the arms 88 and 89 are secured to the plates 30 and the plates can be separated against the compression of a connecting spring 85 upon movement of the rod 90 to the right by a piston (not shown) in the cylinder 82. The plates 30 thereupon separate, to the dotted line position, and release the bundle in the end 29 so that it can be packaged by a tube 40 presented beneath the plates 30. Upon deenergization of the solenoid 80 by the switch 54, the spring 85 contracts and closes the plates 30.

The above-described cycle repeats as the counting gear 43 continues to rotate the operating arm 50 in response to length cutting by the machine 11. The number of lengths packaged in each tube 40 is thus equal to the number of teeth on the gear 43. In the event that a different number of lengths might be desired to be collected at one time, either the gear 43 could be interchanged with another gear having a different number of teeth, or the entire control mechanism 42 may be removed from the machine 11 and another suitable control mechanism substituted therefor.

After the lengths are packaged in the tubes, the tubes may be removed and placed in a rack, similar to that disclosed in the above-identified patent, which is located at the working station where the electrical assembly is being done. The removed tubes can be replaced by unfilled tubes.

Although the apparatus 10 has been specifically disclosed as an automatic packaging apparatus for use with wire cutting and stripping machines, it should be evident to those skilled in the art that the apparatus may also be employed to package automatically predetermined numbers of plastic tubing lengths, lengths of synthetic or glass filaments, and like lengths.

It should also be evident to those skilled in the art that the collector 12, the plates 30 and the turret 31 can be actuated at any time in the operating cycle by merely providing another microswitch in the control mechanism 42 and connecting it in circuit with the source 61, the air solenoid 60, and the air cylinder 39. The positions of the microswitches relative to the operating arm 50 will determine the operating sequence of the collector, plates and turret.

If the apparatus 10 is to be used in combination with a material cutting machine of the type that incorporates a device for stopping the machine after a predetermined number of lengths are cut, the collector 12 can be eliminated and the chute 26 positioned to receive the cut lengths directly from the cutting machine.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of this invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. An apparatus for packaging lengths of material which comprises, a vibratory sloping chute for receiving and advancing such lengths of material and having an end provided with a restricted opening and wall portions converging toward said opening for directing the lengths of material into a bundle, means for feeding a predetermined number of such lengths of material into said chute, means for supporting a container in a loading position in alignment with said end of said chute for receiving the bundle, stop means interposed between the container in the loading position and said end of said chute and cooperable with said chute for supporting and orienting the lengths of material into a bundle, and means for actuating said stop means to permit the movement of the bundle into the container.

2. An apparatus for packaging lengths of material which comprises, a sloping chute for receiving such lengths of material and having an end provided with a restricted opening and wall portions converging toward said opening for directing the lengths of material laterally together, means for vibrating said chute to advance the lengths of material toward said end and into said opening, means for periodically feeding a predetermined number of such lengths of material into said chute, a stop member located adjacent to said end of said chute and cooperable therewith for supporting and orienting the lengths of material into a bundle, means operable in timed relation to said feeding means for actuating said stop member to release a bundle from said chute, carrier means for supporting a plurality of containers successively in a loading position for receiving the bundles released from said chute, and means operable in timed relation to said feeding means for indexing said carrier means to advance successive containers into the loading position.

3. In combination with a machine for severing successive sections from an elongated element of indefinite length and discharging the sections in a substantially horizontal position, means mounted in the path of such sections for receiving and accumulating the sections, means for periodically actuating said accumulating means to effect the ejection of the accumulated sections, a chute having a portion disposed in inclined relation to the horizontal in a position to receive the sections as they are ejected from said accumulating means and having a downwardly directed conical portion provided with a restricted opening, means for vibrating said chute to orient the sections in parallel relation to each other and to effect the longitudinal movement of the sections into the downwardly directed conical portion of the chute and the lateral movement of the sections together in said opening, stop means below said opening of said chute for supporting the sections thereon, means for supporting a tubular container in vertical alignment with said opening and below said stop means, and means for withdrawing said stop means to permit the movement of the elements from said chute into said container.

4. In combination with a machine for severing successive sections from a wire of indefinite length and discharging the wire sections in a substantially horizontal position, a rotary accumulating device having a plurality of axially directed peripheral recesses for receiving the wire sections, means for supporting said accumulating device for rotary movement about the horizontal axis with one of said recesses in position to receive the wire sections as they are discharged from said machine, a counting device actuated by the machine in timed relation to the discharge of wire sections therefrom, means operable under control of said counting device for indexing said accumulating device at predetermined intervals to effect the ejection of the wire sections from a recess of said device and the positioning of another recess for receiving the wire sections from the machine, a chute having a portion disposed in inclined relation to the horizontal in a position for receiving the wire sections ejected from the accumulating device and having a downwardly directed funnel-shaped portion provided with a restricted opening, means for vibrating said chute to effect the orientation of said wire sections into parallel relation

with one another and the longitudinal movement of said wire sections into said downwardly directed portion and into the opening thereof and the movement of the wires thereby into a bundle, stop means mounted for movement below and in close proximity to said opening of said chute for arresting the downward movement of the bundle of wire sections therein, a carrier for supporting tubular containers for receiving the bundles of wire sections, means operable under control of said counting device for indexing said carrier to advance successive containers to a loading position below and in registration with said opening in said chute, and means operable under control of said counting device for actuating said stop means to release the bundle of wire sections for movement into the container.



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