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DE-CURLING ATTACHMENT FOR AUTOMATIC WIRE STRAPPING MACHINES

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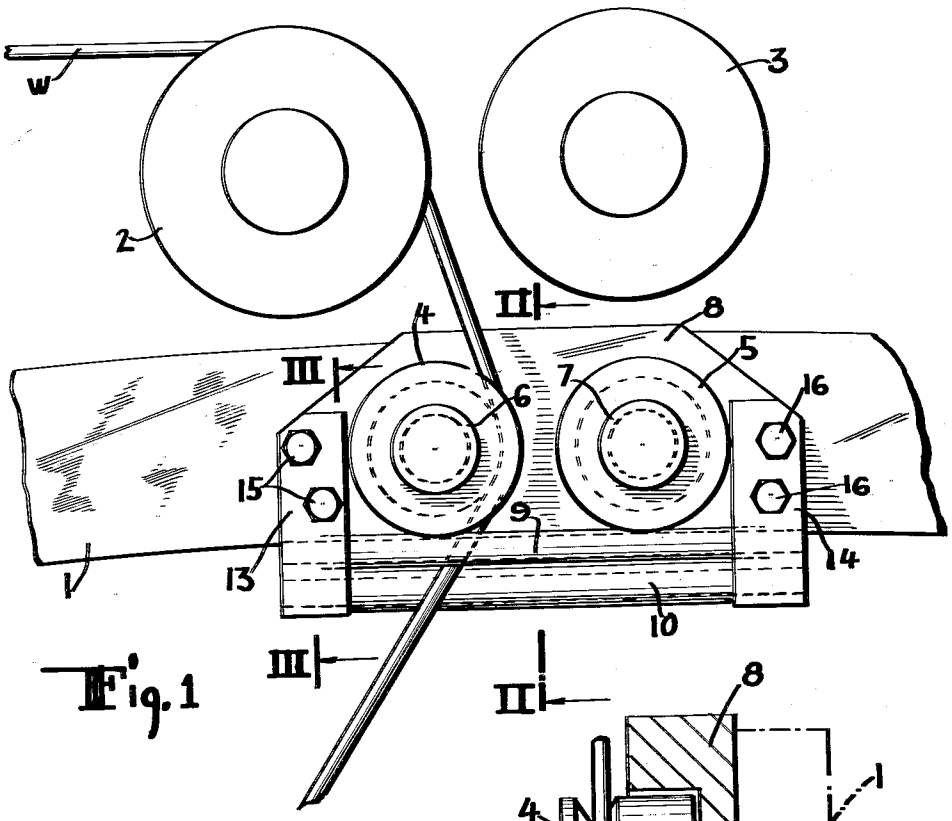


Fig. 1

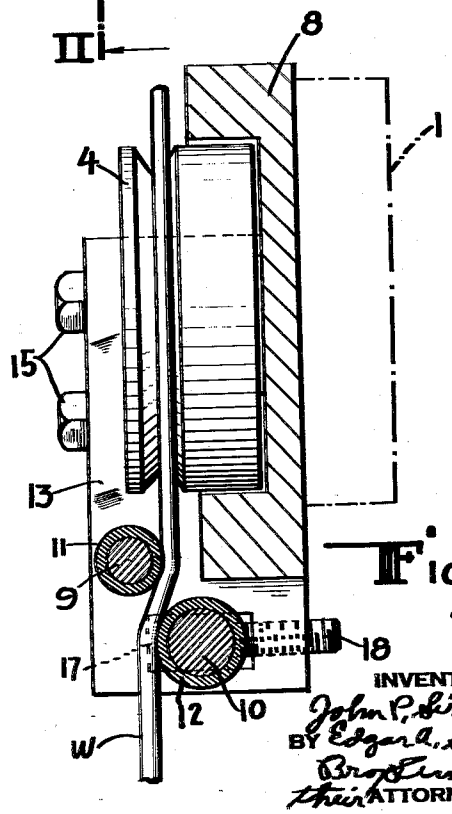


Fig. 2

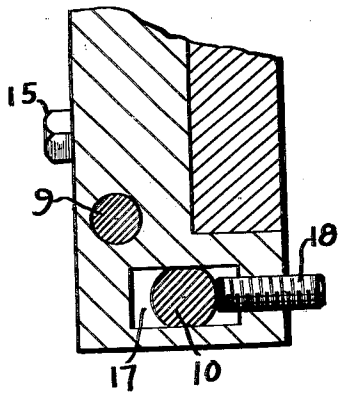


Fig. 3

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DE-CURLING ATTACHMENT FOR AUTOMATIC WIRE STRAPPING MACHINES

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This invention relates to a de-curling attachment for automatic wire strapping machines, which machines are designed to wrap and fasten lengths of wire around articles such as packages, bundles or the like, and has for an object to provide such a device which functions to prevent a set in the wire which has been wrapped and fastened around the article, which set is highly objectionable in that, when the wire is severed in the process of unwrapping the article, it tends to spring violently outwardly from the article with the liability of injury to an operator.

Another object is to provide such a device which is adaptable for use in connection with high tensile strength wire which embodies a definite springy characteristic.

Another object is to provide such a device which is so formed as to lend itself to incorporation in the original construction of a wire strapping machine, and also for attachment to a previously constructed machine without requiring reconstruction or rearrangement of the parts.

A further object is to provide certain improvements in the form, construction, arrangement and material of the several parts whereby the above named and other objects inherent in the invention may be efficiently attained.

Automatic wire strapping machines have been, for a long time, well known to engineers, manufacturers and operatives versed in the facts of industries in which the machines are manufactured and used, and their employment has become very wide spread for the purpose of applying wire straps or bindings one or more times around articles such as unitary packages or bundles composed of a plurality of items.

One type of these machines embodies a frame which supports a large rotatable ring within which the articles to be bound are fed in a direction at right angles to the plane of the ring, each article pausing in the plane of the ring for one or more wrappings and then being moved away for shipment. The large ring carries a plurality, generally a pair, of closely spaced grooved wire wrapping sheaves or rollers to and between which the wire is led under a desired tension from a source of supply. The free end of the wire is caused to be seized by a gripping element mounted on the frame, and the ring is then rotated to revolve the wire wrapping sheaves around the article until the wire overlaps the gripped end thereof and is seized by a second gripping element. The overlapped portions of the wire are then fastened together, as by twisting or welding, and the wire strapping or binding thus formed is severed from the source of supply and released by the first gripping element. The machine is now ready for a similar succeeding operation in which the free end of the wire is held by the said second gripping element and the overlapping portion is seized by the first gripping element, which successive operations are continued indefinitely as occasion demands.

In one largely used class of these machines the successive operative rotations of the large ring are in opposite directions, i.e. clockwise and anti-clockwise. See, for instance, U.S. patent to Albert E. Cranston, Sr. No. 2,687,-082, issued August 24, 1954; and U.S. patent application of Albert E. Cranston, Jr., Serial No. 595,771 (now Patent No. 2,941,464), filed July 3, 1956. In another class, the large ring rotates intermittently in a single direction, as exemplified by U.S. patent to Charles F. Osgood, Jr., et als., No. 2,748,692, issued June 5, 1956. The present invention is directed particularly to employment in machines of the first mentioned class.

It is a requisite that the articles be strapped or bound with wire of tensile strength fully adequate in consideration of the character of the article and the kind and distance of shipment, which commonly leads to the use of high, and sometimes very high, tensile wire which involves a definite springy characteristic. It is also customary to fasten together or knot the ends of the wire at the bottom of the article so that, when received by the purchaser, the knotted section of the wire is customarily inaccessible as the articles are placed, individually or in stacks, upon the floor or other supporting surface. As stacking is the usual procedure, it is the ends or sides of the article that are presented to and within easy reach of the operative whose duty it is to unbind the article. This he accomplishes by severing the wire with shears, or the like, and the sudden release of the wire thus entailed permits its tensioned condition, springy characteristic, and the set therein imparted by the step of wrapping around the article, to cause an instantaneous and violent throwing or springing away from the article of the portions of the wire adjacent the point of severing. This not only involves the likelihood, but frequently the occurrence, of injury, sometimes serious, to the operative. Furthermore, when the severed wire binding is removed bodily from the package, it habitually assumes a highly irregular and distorted form which seriously handicaps the orderly depositing of the same in a receptacle for transportation to a disposal point. Thus, it is difficult satisfactorily to fill the receptacle, and portions of one or more wire bindings therein protrude from the receptacle with danger and occurrence of catching upon and scratching or otherwise injurying other furnishings or personnel. The present invention is calculated to, and does, overcome these last named disadvantages to the extent that, when the wire is severed for unbinding the article, it merely has a tendency for its portions adjacent the point of severing to hug the side or end of the article with mild force, while the severed wire binding, as a whole, retains substantially the cross-sectional shape of the article around which it was previously wrapped and remains in a single plane so that it may conveniently and in an orderly manner be deposited in a suitably shaped receptacle, without protruding therefrom, for transportation to a disposal point.

In brief summary, the invention comprehends a pair of elongated rolls, hereinafter called de-curling rolls, slightly spaced from each other, which are secured to the hereinabove mentioned large rotatable ring adjacent the pair of wire wrapping sheaves, the axes of the said elongated rolls being at angle, preferably right angle, to the axes of the sheaves. In preparing the machine for operation, the free end of the wire is initially led from its source of supply between and through the pair of sheaves and then between and through the pair of elongated rolls, before it is caused to be seized by the first gripper, as hereinabove described, preparatory to a winding or wrapping rotation of the large ring. This attachment or device thus imparts a set to the wire as it is being wrapped around the article, which set is at an angle, preferably right angle, to the set imparted to the wire by the pair of wrapping sheaves; and the combined effect or result of these two set tendencies which influence the wire is the elimination of the hereinabove explained habitual characteristic of the wire binding to spring out from the article when it is severed and assume a distorted conformation. One of the elongated rolls is made adjustable with respect to the other for the purpose of varying the degree of set imparted to the wire by the

said rolls. It will be clear that this device constituting the subject matter of the present invention is in the nature of an attachment which may be built into winding machines of the character hereinbefore described, as well as others adapted for the same general purpose; and that the device or attachment may also be secured to machines previously manufactured and in use without causing disruption of constructional features or arrangement and without occasioning any change in the manner or mode of operation of the machines.

A practical embodiment of the invention is represented in the accompanying drawing, in which

FIG. 1 represents a front elevation of the de-curling attachment or device secured to a portion of a large rotatable ring of a wire strapping or binding machine immediately below a pair of wire wrapping sheaves also carried by the ring, together with a pair of wire feed rollers carried by the frame of the machine; a portion of wire being indicated as coming from a source (not shown) and threading between the feed rollers, the wrapping sheaves, and the de-curling rolls;

FIG. 2 represents an enlarged vertical section taken in the plane of the line II—II, of FIG. 1, looking in the direction of the arrows; and

FIG. 3 represents a detail section, on the same scale as FIG. 2, taken in the plane of the line III—III of FIG. 1, looking in the direction of the arrows.

Referring specifically to the drawing, a section of a large rotatable ring of an automatic wire strapping or binding machine such, for instance, as hereinabove described, is indicated by **1**. Two feed rollers, diagrammatically indicated as mounted on the frame of the machine, are denoted by **2** and **3**, while the wire is marked W. The pair of wire wrapping sheaves is indicated by separate numerals applied to each, **4** and **5**. These sheaves are rotatably mounted on stud shafts **6**, **7**, which are supported in a block **8** that is fixed in any suitable manner, as for instance, by welding or bolting or screwing (not shown), to the large ring **1**.

The elongated de-curling rolls are marked **9** and **10**. They are preferably composed of a suitable metal, such as iron or steel, and are provided with hardened steel surfaces marked **11** and **12**.

The said de-curling rolls are mounted with one vertically higher than the other, and out of line, so that the upper roll is not directly above the lower but its surface is in line with the grooves in the sheaves **4** and **5**. The lower roll is shown as larger in diameter than the upper roll, but this is not of functional importance. The mounting for the said rolls consists of a pair of brackets **13**, **14**, which are secured, as by screws **15**, **15**, **16**, **16**, to the face of block **8**, in which brackets the ends of the rolls are rotatably housed.

The brackets are formed with horizontally elongated housing apertures, one of which is shown in FIG. 3 and marked **17**, for the ends of de-curling roll **10**; and the ends of the said roll are backed by set screws, one of which is shown and marked **18**, for adjusting the said lower de-curling roll **10** horizontally with respect to the upper roll **9** in order to provide a greater or less degree of bend to the wire W as it is threaded and passes through the said de-curling rolls.

In operation, the free end of the wire from the supply source thereof is threaded or trained between the guide rollers **2**, **3**; then between the wrapping or winding sheaves **4**, **5**; then between the de-curling rolls **9**, **10**; and then caused to be seized by a gripper (not shown) carried by the machine frame preferably at a point below the machine support for the article to be strapped or bound, all as explained in the early part of this specification. The means (not shown) for rotating the large ring **1** is then activated to rotate the latter, which rotation, in the showing of the drawing, will be in a clockwise direction. At the completion of the rotation cycle of the ring **1**, in which position the wire will be overlapped at the

under side of the article being wrapped, the wire is seized by a second gripper; knotted, as by twisting or welding, between the two grippers; and then severed so that the article is bound by a wire strap, and the then free end of the wire is held by the second gripper. This description is essentially repetition of explanation in a foregoing portion of this specification and is, and has been for a long time, so well understood by those acquainted with the industries in which strapping or binding machines of this character are manufactured and used, as to be deemed to call for no illustration and no more detailed description. In the wrapping or wire winding step, the objectionable set hereinabove described as imparted to the wire by its movement in the plane of the large ring **1** is counteracted or neutralized by the effect of the de-curling rolls **9**, **10**, which tend to impart to the wire a set substantially at right angles to the set imparted by the sheaves **4**, **5**. This results in the beneficial effect previously explained whereby, when the wire strap is severed, as by shears, at a point on one side of the article, the wire portions adjacent the point of severance merely tend lightly to hug the package instead of flying outwardly in violent manner, and the severed wire strap, as a whole, retains substantially the shape or form it had when serving as a strapping or binding for the article.

The succeeding operation of the machine will be the same as that just described except that, in the glass of machines wherein the ring **1** rotates in successive opposite directions, the succeeding operation now referred to will entail rotation of the large ring **1** in an anti-clockwise direction. During part of the ring rotation in each direction the wire will contact one or the other of the sheaves **4**, **5**, and guide rollers **2**, **3**, and at times it will contact both guide rollers. The immediately foregoing comment is merely explanatory of the inherent operation of these machines.

As both the gauge and composition of the wire differ in connection with the requirements of strapping articles of various kinds, it is desirable in order to obtain full benefits of the invention to impart a greater or less bend to the wire by the de-curling rolls **9**, **10**; and this may be accomplished by adjusting one or both of the rolls, preferably the lower roll **10**, by means of the screw **18**, as clearly depicted in FIG. 2 of the drawings.

It is deemed unnecessary to expatiate upon the theory of stresses, or the like, which causes the functioning of the de-curling rolls **9**, **10**, to eliminate the objectionable set in the wire which the wrapping or winding sheaves **4**, **5**, and their carrier ring **1** would, in the absence of rolls **9**, **10**, impart to the wire, as ample test and practical operation has empirically demonstrated that the beneficial result hereinabove explained is uniformly attained.

It should further be noted that the language of the foregoing description refers to wire strapping, and it is a fact that the invention is designed especially for machines employing wire that is, as usual, round in cross-section. However, it is also a fact that the invention functions in connection with machines that use wire of other than round cross-section such, for instance, as oval or square. The only change needed in connection with wires of other than round cross-section, such as just named, is to position the de-curling rolls **9**, **10**, slightly further away from the wrapping sheaves **4**, **5**, in order to permit the wires having the last named cross-sectional shapes to turn 90 degrees after leaving the wrapping sheaves and before entering the de-curling rolls. Accordingly, we intended the word "wire" used in the claims to have a scope sufficient to cover wires of various cross-sectional shapes, as just indicated.

It will be understood that various changes may be resorted to in the form, construction, arrangement, and materials of the several parts without departing from the spirit or scope of the invention; and hence we do not intend to be limited to details herein shown or described,

except as the same may be included in the claims or may be required by disclosures of the prior art.

What we claim is:

1. A wire de-curling device designed and adapted for incorporation in the original construction of or attachment to a previously constructed wire strapping machine of the class which includes an oppositely rotatable ring for revolving wire wrapping means in clockwise and anti-clockwise directions around an article to be strapped, which machine has at least two grooved wrapping sheaves carried by the ring adapted to wrap the wire in opposite directions in a plane parallel with the plane of rotation of the ring and means for fastening the wrapped wire, said device comprising, a plurality of spaced elongated rolls, a mounting in which the ends of the rolls are supported adapted to be secured to the ring with the rolls positioned radially inwardly of the sheaves and with their axes at substantially a right angle to the axes of the sheaves, said rolls being constructed and arranged for receiving therebetween and in contact with their surfaces the wire after it leaves the sheaves and before it is wrapped around the articles to impart to the wire automatically a set at an angle to the plane of rotation of the ring which is effective to counteract and neutralize in the wrapped wire the set imparted thereto by the wrapping sheaves and cause the wrapped wire when severed in unwrapping the article to tend to hug the adjacent portion of the article in distinction from tending to spring outwardly therefrom.

2. In a wire strapping machine including an oppositely rotatable ring for revolving wire wrapping means in clockwise and anti-clockwise directions around an article to be strapped and having at least two grooved wrapping sheaves carried by the ring adapted to wrap the wire in opposite directions in a plane parallel with the plane of rotation of the ring and means for fastening the wrapped wire, a device for preventing the said wrapping steps from imparting an objectionable permanent set to the wrapped and fastened wire, said device comprising, at least two elongated rolls carried by the ring radially inwardly of

the sheaves with their axes at an angle to the axes of the sheaves and constructed and arranged to receive the wire therebetween as it leaves the sheaves and impart to the wire a set functionally opposed to and effective to counteract and neutralize the set imparted by each of the said sheaves, the said rolls being also so relatively arranged and positioned that their wire contacting surfaces bend the wire received from the sheaves at an angle to the plane of rotation of the ring.

3. A wire de-curling device designed and adapted for attachment to a wire strapping machine including an oppositely rotatable ring for revolving wire wrapping means in clockwise and anti-clockwise directions around an article to be strapped and having at least two grooved wrapping sheaves carried by the ring adapted to wrap the wire in opposite directions in a plane parallel with the plane of rotation of the ring and means for fastening the wrapped wire, said device comprising, a plurality of spaced elongated rolls, a mounting in which the ends of the rolls are supported, said mounting being adapted to be secured to the ring with the rolls positioned inwardly of said sheaves and constructed and arranged for receiving therebetween the wire being wrapped and imparting thereto a bend substantially at a right angle to the plane of rotation of the ring which is operative to counteract and neutralize in the wrapped wire the set imparted thereto by the wrapping sheaves, the said rolls being relatively adjustable in their mounting so that, when attached to the ring, they may be relatively adjusted axially of the ring to vary the degree of bend imparted to the wire.

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