Aug. 17, 1948. A. E. BRICKMAN 2,447,155

METHOD AND APPARATUS FOR SWAGING AND BENDING

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FIG. 1.

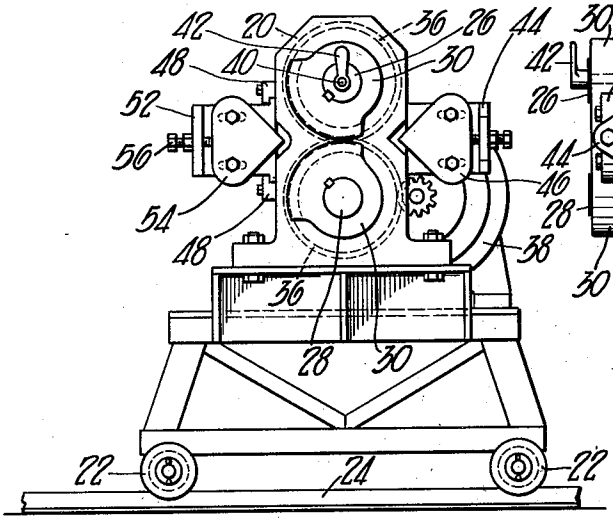


FIG. 2.

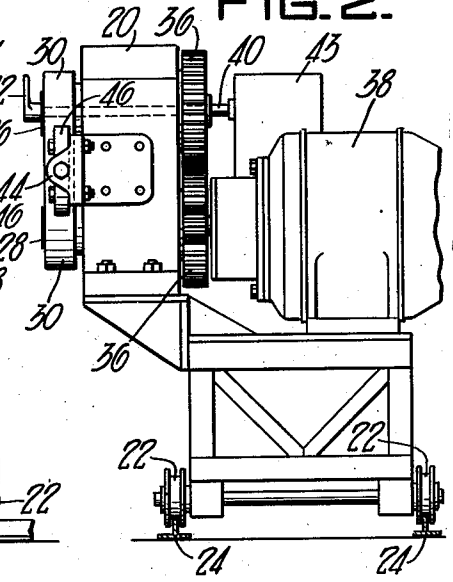


FIG. 3.

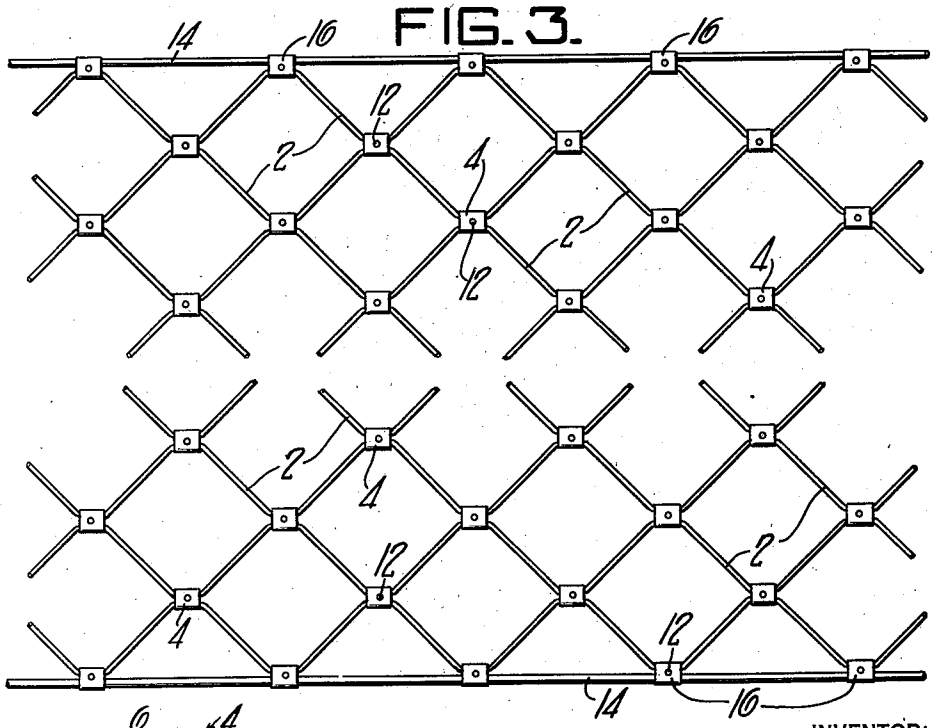
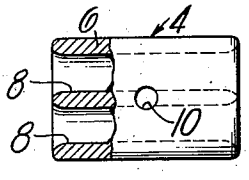


FIG. 7.



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FIG. 6.

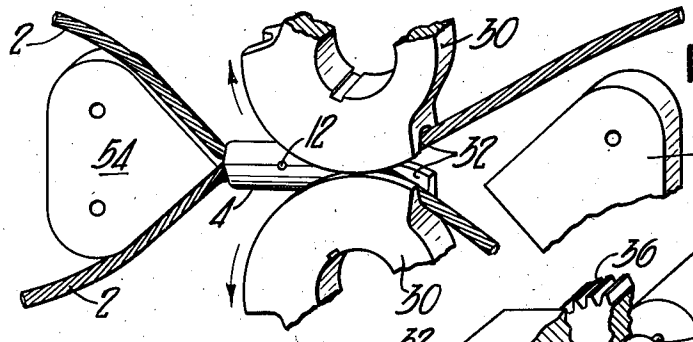


FIG. 4.

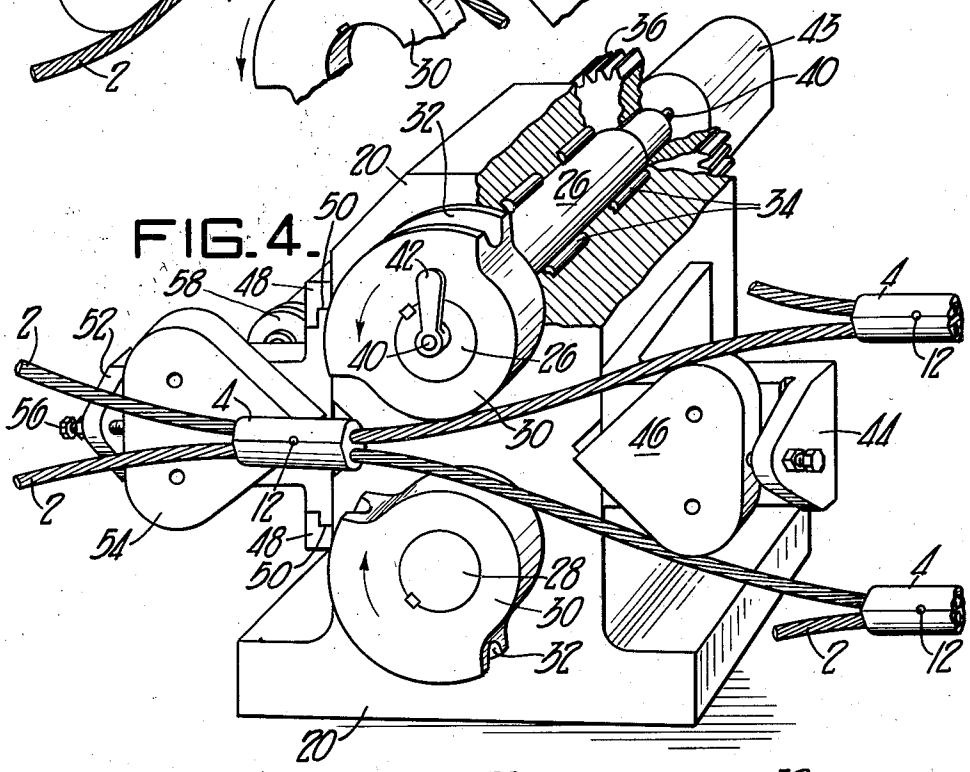


FIG. 5.

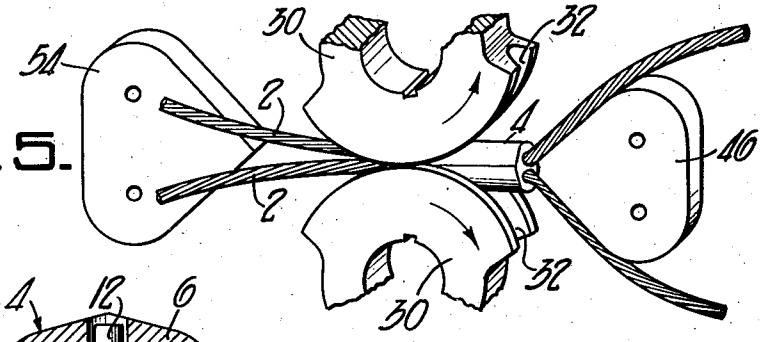
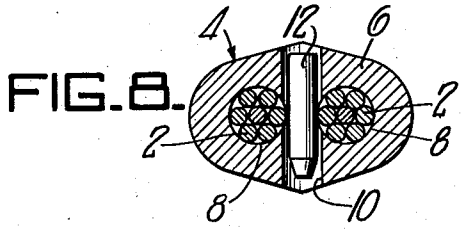


FIG. 8.



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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR SWAGING AND BENDING

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Application January 17, 1946, Serial No. 641,664

7 Claims. (Cl. 140—1)

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This invention relates to a method and apparatus for swaging and bending and more particularly to such a method and apparatus for fastening a sleeve assembled on two stranded wire structures to the wire structures by swaging and at the same time spreading the wire structures at the point that they leave the sleeve. The invention is of particular utility in the manufacture of torpedo nets such as disclosed in my copending application, Serial No. 581,310, filed March 6, 1945. Prior to my invention when it was desired to expand nets such as disclosed in my above identified application, sleeves were swaged to the wire structures which were thereafter spread by separate means. The spreading was done by securing the foot wire of the net and then applying tension along the head wire to spread the entire net at one time, by partial tension spreading followed by individual setting at each intersection, or by individual setting with a two man power tool. In all of these practices, the inconsistencies in set produced an open net structure having numerous areas which bagged. This also caused variations in the width and length dimensions of the net. When the net was towed along with a moving ship, these bagged areas caused a snaking motion through the sea, thus increasing the resistance to movement and decreasing the ship's speed. In static use, the reversals of the bagged areas caused by motion of the water further aggravated the strand members on which the greater suspension tensions had been applied, this causing fatigue failure and a short net life.

It is an object of my invention to provide a method of swaging sleeves to two stranded wire structures and at the same time spreading the wire structures to produce an open structure having uniform dimensions.

Another object is to provide apparatus for carrying out the above described method.

These and other objects will be more apparent after referring to the following specification and attached drawings, in which:

Figure 1 is a front elevation of the swaging and bending apparatus;

Figure 2 is a side elevation thereof;

Figure 3 is a view showing a completed torpedo net;

Figure 4 is a perspective view of the upper part of the swaging apparatus;

Figure 5 is a fragmentary view similar to Figure 4, but showing the position of the stranded wire structures at the end of the swaging operation;

Figure 6 is a fragmentary view similar to Figure 5 but showing the position of the stranded wire structures and the clip at the conclusion of the swaging and spreading operation;

Figure 7 is an enlarged plan view of the double-barrel sleeve used in the net with a portion broken away and drawn in section; and

Figure 8 is a transverse sectional view of the sleeve of Figure 7 showing it fastened to the ropes of the net.

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Referring more particularly to the drawings, it will be seen that the net consists of a plurality of stranded wire structures 2, which are bent in zigzag arrangement in side by side relationship, the apices of the adjacent wire structures being connected by double-barrel connectors 4 which are preferably of the type disclosed in my copending application, Serial No. 563,286, filed November 13, 1944, and entitled "Method and means for securing fittings to wire structures." The double-barrel sleeve, as shown in Figures 7 and 8, consists of a body portion 6 having two longitudinal openings 8 therethrough and a small transverse opening 10 extending through the body between the openings 8 and intersecting said openings. This opening is adapted to receive a pin 12 of slightly greater diameter than the distance between the stranded wire structures 2 for holding the sleeve initially in place thereon. Further details and other modifications of the sleeve are disclosed in my above mentioned application. It will be seen that alternate sleeves on each wire structure are connected to the wire structures on opposite sides thereof. The outer circumference of the net is preferably formed of heavier wire structures 14 called boundary ropes, which are fastened to the mesh portion of the net by means of sleeves 16.

In making the net by the method disclosed in my copending application, Serial No. 581,310, filed March 6, 1945, the double-barrel sleeves 4 are assembled on the wire structure in the desired position and thereafter are swaged to the wire structures and the wire structures are spread to produce an open net structure.

The apparatus of my invention consists of a carriage housing 20 mounted on wheels 22 for movement along tracks 24. Mounted in the housing 20 are two parallel shafts 26 and 28. Keyed to the front end of these shafts are like cam shaped swaging rollers 30 having parallel U-grooves 32 which together form an aperture slightly smaller than the outside contour of the sleeves 4. The shafts 26 and 28 are rotated in opposite directions in bearings 34 by means of gearing 36 which is driven by means of an electric

motor 38. The shaft 26 is hollow and passing therethrough is a rod 40 having a three-way positioned wing latch 42 secured to its front end which operates a reversing switch 43 mounted beyond the gearing 36. Attached to the right side of the housing 20, as shown in Figure 1, is a bracket 44 on which is mounted a spreader cam 46 in line with the grooves 32. This cam is adjustable in a horizontal direction to and from the rolls 30 in order to compensate for different lengths of sleeves 4. A bracket 48 is mounted on the other side of the housing 20 and is provided with slides 50 for slidably receiving a support 52 which supports a second spreader cam 54. This cam is also adjustable horizontally to and from the rolls 30 by means of a screw 56. A hydraulic cylinder 58 has its piston rod attached to the support 52 for moving it transversely of the roll pass.

In operation, the unspread torpedo net is suspended just in front of the swaging rolls with the sleeves 4 arranged in a horizontal position and the line of sleeves approximately in the same horizontal plane as a point between the rollers. In this suspension the weave of the net is spread slightly by its own weight and flexibility. With the stranded wires 2 and the rolls 30 in approximately the position shown in Figure 4 and the machine stopped, the net intersection is pushed into line with the grooves 32 with one strand carried over and one under the spreader cam 46 as shown. Cam 54 is in its retracted position. The wing latch 42 is turned in the direction which causes the motor 38 to drive the swaging rolls in the direction of the arrows in Figure 4. This swages the sleeve 4 to the stranded wire structure, that is the sleeve metal flows into the interstices of the wire structure to develop a non-slip grip connection. During the swaging operation, the sleeve 4 is forced to the right as shown in Figure 4 and forces the wire structures 2 against the spreader cam 28 to bend them sufficiently to give them a permanent set at approximately the point that they leave the sleeve. The wing latch 42 is turned to the stop position when the rolls reach a position where any further power applied would result in slippage between slip clip 4 and the grooves 32, this being the position shown in Figure 5. If a longer sleeve than that shown is being swaged, the cam 46 is moved away from the rolls 30 and if a shorter sleeve is used the cam is moved toward the rolls. With the machine stopped, the spreader cam 54 is moved out in line with the grooves 32 with one strand being carried over and one under the cam 54. The wing latch 42 is turned to its reverse position and the sleeve is moved to the left as shown in Figure 6 to force the wire structures at that end of the sleeve against the spreader cam 54 to bend them sufficiently to give them a permanent set. The wing latch is turned to its stop position after the grooves 32 are sufficiently clear of the sleeve 4 and strands 2 to permit their withdrawal from between the rolls. If the net is suspended from a point several feet above the swaging rolls, there will be sufficient flexibility in the net to swage five or more intersections in a vertical row before advancing the machine to the next position along the rails 24. The operation is then repeated in the new position.

While one embodiment of my invention has been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. Apparatus for fastening a sleeve assembled on two stranded wire structures to the wire structures and spreading the wire structures at the point that they leave the sleeve which comprises a pair of parallel shafts, a swaging roll mounted on each shaft, said rolls having parallel grooves therein which together form an aperture slightly smaller than the outside contour of the sleeve, a spreader cam in line with the grooves and adjacent thereto, one of said wire structures passing on each side of the cam, means for rotating the rolls to swage the sleeve to the wire structure and force the wire structures against the spreader cam to bend them sufficiently to give them a permanent set at approximately the point that they leave the sleeve.

2. Apparatus for fastening a sleeve assembled on two stranded wire structures to the wire structures and spreading the wire structures at the point that they leave the sleeve which comprises a pair of parallel shafts, a swaging roll mounted on each shaft, said rolls having parallel grooves therein which together form an aperture slightly smaller than the outside contour of the sleeve, a spreader cam on each side of the rolls in line with the grooves and adjacent thereto, one of said cams normally being out of line with the grooves, one of said wire structures passing on each side of the other of said cams, means for rotating the rolls to swage the sleeve to the wire structure and force the wire structures against the second spreader cam to bend them sufficiently to give them a permanent set at approximately the point that they leave the sleeve, means for moving the first cam into line with the grooves with one of the wire structures on each side of the cam, and means for rotating the rolls in a reverse direction to force the wire structures against the first cam to bend them sufficiently to give them a permanent set at approximately the point that they leave the sleeve.

3. Apparatus for spreading a pair of wire structures assembled on a sleeve which comprises a spreader cam, one of said wire structures passing on each side of the cam, and means for feeding the sleeve toward the spreader cam to force the wire structures against the cam to bend them sufficiently to give them a permanent set at approximately the point that they leave the sleeve.

4. The method of fastening a sleeve assembled on two stranded wire structures to the wire structures and spreading the wire structures at the point that they leave the sleeve which comprises spreading the wire structures on one end of the sleeve so that one wire structure is on each side of a spreader cam, passing the sleeve through a pair of rotating swaging rolls, and forcing the wire structures against the spreader cam by the rotation of the rolls to bend them sufficiently to give them a permanent set at approximately the point that they leave the sleeve.

5. The method of fastening a sleeve assembled on two stranded wire structures to the wire structures and spreading the wire structures as they leave the sleeve which comprises spreading the wire structures on one end of the sleeve so that one wire structure is on each side of a spreader cam, passing the sleeve through a pair of rotating swaging rolls, forcing the wire structures against the spreader cam by the rotation of the rolls to bend them sufficiently to give them a permanent set at approximately the point that they leave the sleeve, spreading the wire structure on the other end of the sleeve so that one

wire structure is on each side of a second spreader cam, and reversing the rotation of the rolls to force the wire structures against the second spreader cam to bend them sufficiently to give them a permanent set at approximately the point that they leave the sleeve.

6. The method of fastening a sleeve assembled on two stranded wire structures to the wire structures and spreading the wire structures at the point that they leave the sleeve by means of a pair of swaging rolls having parallel grooves therein and a spreader cam which method comprises spreading the wire structures on one end of the sleeve so that one wire structure is on each side of the spreader cam, passing the sleeve through the rolls to swage the sleeve to the wire structures, and forcing the wire structures against the spreader cam by the rotation of the rolls to bend them sufficiently to give them a permanent set at approximately the point that they leave the sleeve.

7. The method of fastening a sleeve assembled on two stranded wire structures to the wire structures and spreading the wire structures at the point that they leave the sleeve by means of a pair of swaging rolls having parallel grooves therein and a pair of spreader cams which method comprises spreading the wire structures on one end of the sleeve so that one wire structure is on each side of one of the spreader cams, passing the sleeve through the rolls to swage the sleeve to the wire structures, forcing the wire structures against the last named spreader cam by the rotation of the rolls to bend them sufficiently to give them a permanent set at approximately the point that they leave the sleeve, bringing the second cam into line with the grooves on the side of the rolls opposite the first cam, spreading the wire structures on the other end of the sleeve so that one wire structure is on each side of the second spreader cam, and reversing the rotation of the rolls to force the wire structures against the second spreader cam to bend them sufficiently to give them a permanent set at approximately the point that they leave the sleeve.

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The following references are of record in the file of this patent:

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