March 21, 1961 R. M. NEFF 2,975,817

CORRUGATING MACHINES

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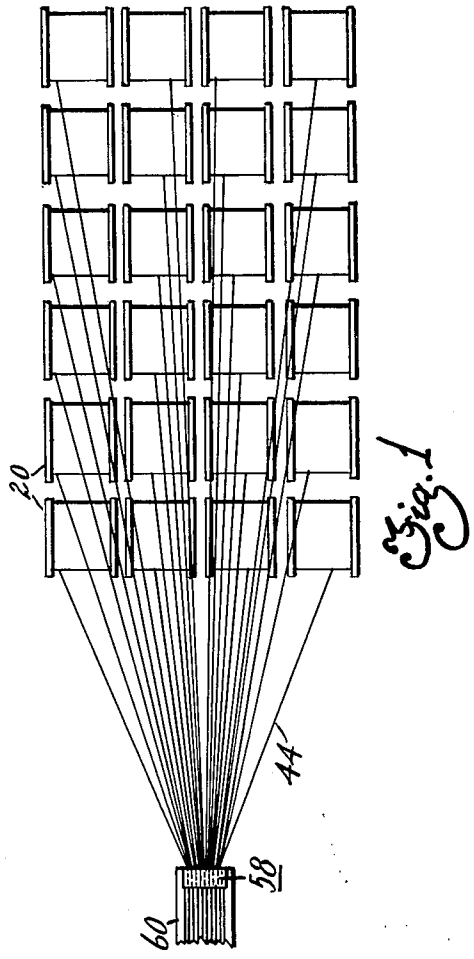


Fig. 1

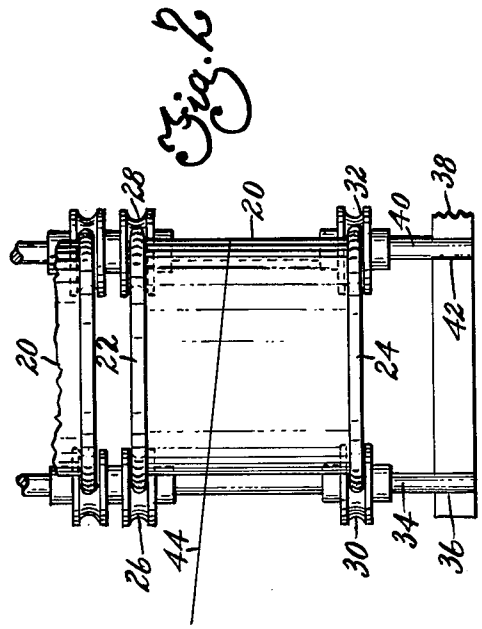


Fig. 2

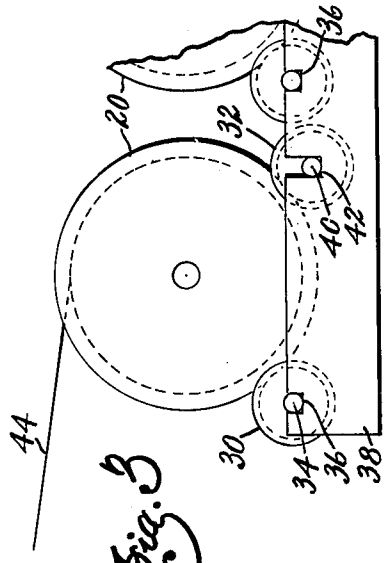


Fig. 3

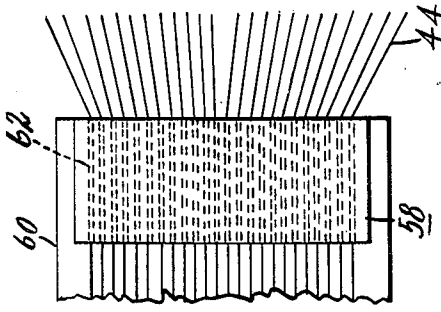


Fig. 4

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CORRUGATING MACHINES

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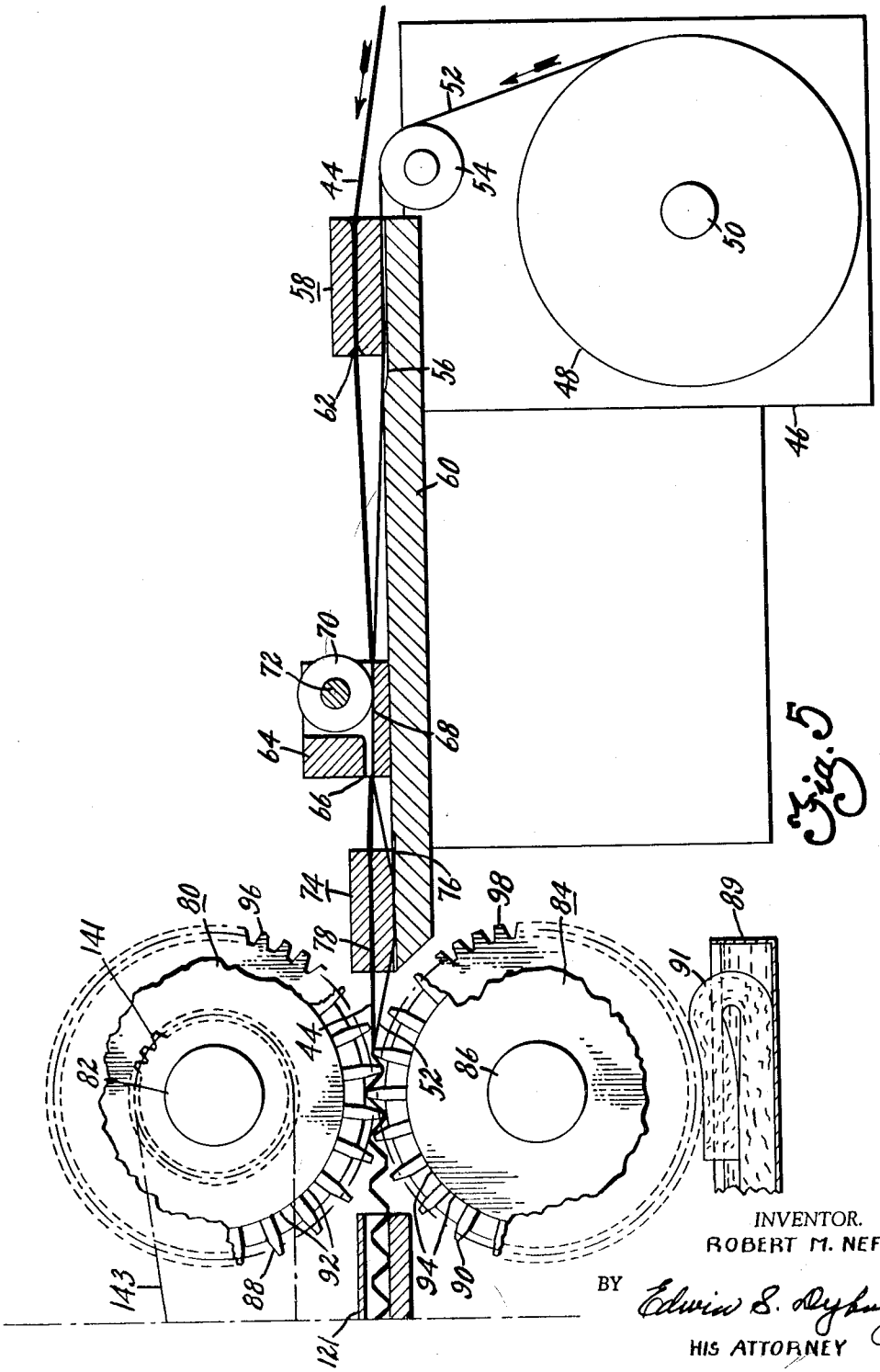


Fig. 5

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March 21, 1961 R. M. NEFF 2,975,817

CORRUGATING MACHINES

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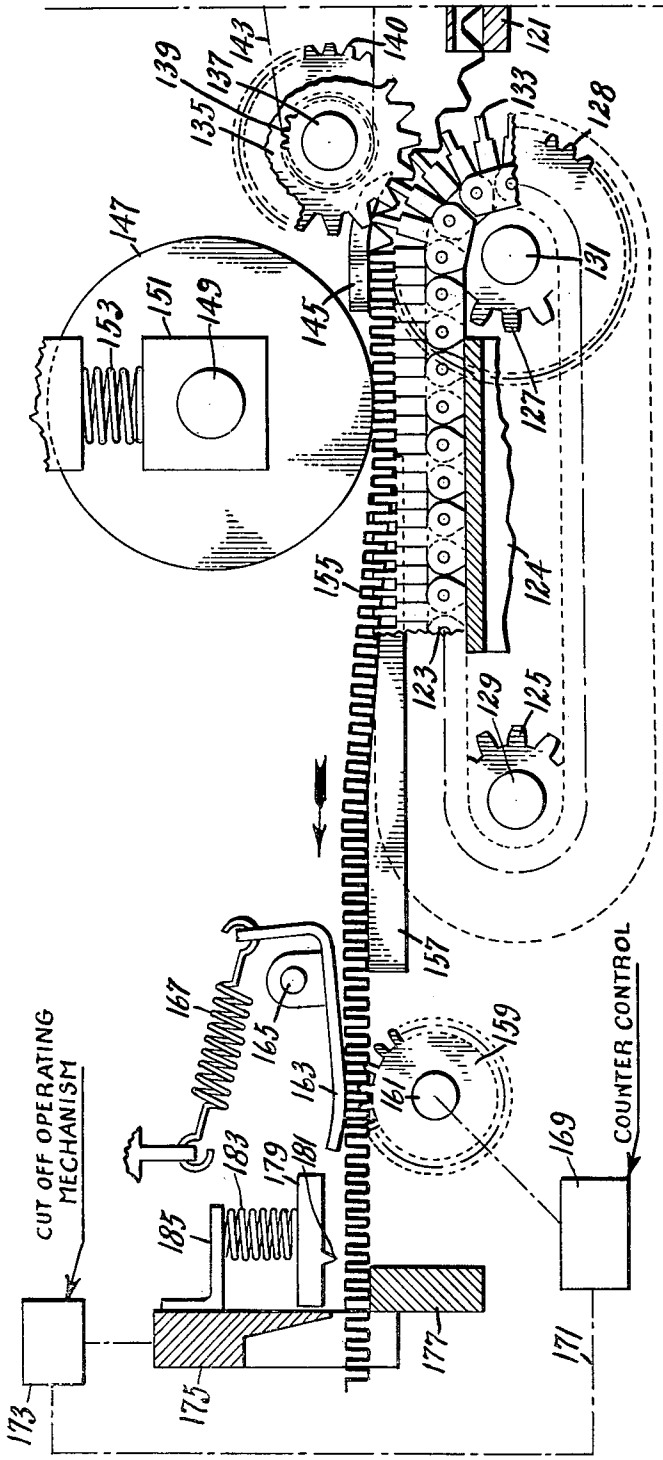


Fig. 6

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2,975,817

CORRUGATING MACHINES

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3 Claims. (Cl. 153—2)

This invention pertains to corrugating machinery and especially to machines for simultaneously corrugating superimposed wire and strip material.

Superimposed wire and strip material have been corrugated together between dies in a stamping operation. This method was satisfactory for trial runs but is too slow and expensive for high volume production.

It is an object of this invention to provide a machine for economically superimposing a corrugating wire and strip material at a high rate and economically cutting the corrugated wire and strip material in predetermined lengths.

It is another object of this invention to provide a simple, economical machine by which corrugations can be formed in superimposed wire and strip material by a rolling operation.

These and other objects are attained in the machine disclosed in the drawings in which wires are taken from a plurality of spools of wire and guided in parallel paths over a strip of metal and passed simultaneously over a plate and beneath a roll having a resilient surface. From this point, the wire and strip is fed between toothed corrugating rolls in which the teeth or projections squeeze the wire and the strip together against the alternate depressions to interlock the wire and strip as it is corrugated. The corrugated wire and strip so interlocked are fed between a toothed roller and a chain carrying blades which shape and compact and form the corrugations into the final shape desired. The corrugations then pass over a counter roll operating a counter control mechanism which, in turn, controls a cut-off operating mechanism which automatically cuts the interlocked corrugated wire and strip material into the lengths desired.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Figure 1 is a top view of the wire spool supply arrangement;

Figure 2 is an enlarged top view of one of the wire spools and its rotatable supporting arrangement;

Figure 3 is a view, in elevation, of one of the wire spools and its rotating support arrangement;

Figure 4 is an enlarged top view of the initial guide for the wires and the strip material;

Figure 5 is a view in elevation, partly diagrammatic, showing the first set of corrugating rolls and the feeding mechanism therefor; and

Figure 6 is a view in elevation extending as a continuation of Figure 5, partly diagrammatic, composed of the final compacting, forming, counting and cutting mechanism.

Referring now to the drawing and more particularly to Figure 1, there is shown a plurality of rows of wire spools each designated by the reference character 20. The rims 22, 24 of each spool 20 are supported, respectively, upon the grooved rollers 26, 28 and 30, 32. The rollers 26 and 30 are rotatably mounted upon each of the forward rods 34, all of which are supported in the upper notches 36 of the side supports 38, as shown in Figure 3. The sets of rollers 28 and 32 are rotatably mounted upon each of the rearward rods 40 which are supported in the lower notches 42 in the support 38. By this particular arrangement, when any of the spools 20 are empty, such a spool can be readily replaced by a full spool without disturbing any of the other spools. The forward rods 34 in front of the spools 20 are higher than the rods 40 at the rear of the spools to compensate for the pull of the wire 44 as it is being pulled off or unwound from the respective spools 20.

Referring now more particularly to Figure 5, there is shown a support 46 spaced from the group of wire spools 20 which rotatably supports a roll 48 of strip metal which is rotatably mounted upon the axle 50. The strip 52, in unwinding from the roll 48, passes over the guide roller 54 into the slot 56 in the lower portion of the guide means 58 on top of the table 60. The guide means 58 contains, in a layer above and parallel to the horizontal slot 56, a horizontal series of parallel bores 62. One of the wires from one of the wire spools 20 passes through one of these bores 62 directly over the strip 52 as it passes through its slot 56. The wires are arranged in a symmetrical path between the spools and the respective bores in the guide means 58, as shown in Figures 1 and 4.

On the table 60 at the left of the guide means 58 is a block 64 containing a horizontal slot 66 through which passes the superimposed wires 44 and strip 52. The slot 66 has a flat bottom surface 68 against which is pressed the wires 44 and the strip 52 by a roller 70 having its outer surface formed of resilient neoprene. This roller 70 serves to hold the wires 44 and the strip material 52 firmly in contact. In the event that one of the spools has all the wire drawn from it, the starting end of the wire of the new spool is passed through its bore in the respective guide and under the roller 70. The roller 70 is rotatably mounted upon the shaft 72. The roller 70 may have its surface layer of any suitable elastomeric material such as natural or synthetic rubber in addition to the neoprene previously mentioned.

The wires are fed through a second guide member 74 also mounted upon the table 60, having between it and the table 60 a lower horizontal slot 76 through which the strip 52 passes. This slot 76 is formed between the guide and the adjacent surface of the table 60 which is slightly under-cut to provide a portion of the slot. The guide 74 is also provided with a plurality of parallel horizontal bores 78 through which extend the different wires 44. The starting end of a spool of wire 20 is fed under the roller 70 and through one of the bores 78 when starting a new spool. The rotation of the roller 70 will move the wires 44 and the strip 52 together uniformly, especially including a starting end of a wire through the guide 74 to the first set of corrugating rolls.

The guide 74 guides the superimposed wires 44 and strip 52 in between the first set of corrugating rolls. This includes the upper roll 80 rotatably mounted on the shaft 82, and a lower roll 84 rotatably mounted on the shaft 86. These rolls each have toothed projections 88 and 90, respectively, and depressions 92 and 94. The rolls 80 and 84 are each provided with gears 96 and 98 which mesh so as to cause the projections of each of the rolls to enter into the intervening depressions of the other roll in the manner of ordinary intermeshing gears. The clearance between the projections 88, 90 and the depressions 94, 92 at their nearest positions at the point at which they cross the centerline between the shafts or axles 82 and 86, is less than the total thickness of the wire 44 and the strip 54, so that they are meshed and inter-

locked. A folded strip 91 of felt is saturated with an oil lubricant by capillary action from the lubricant in the pan 89 and applies lubricant to the tips of the projections 90 as they contact it. The inter-engagement of the projections and the depressions at the same time corrugates the superimposed wire and strip, as shown on the left of Figure 5. The meshing of the wire and the strip 44 and 52 together between the rollers 80 and 84 provides sufficient meshing and interlocking of the wires and the strip so that they are held together for further processing. The corrugating rolls 80 and 84 are power driven at a uniform rate and pull the wires 44 and the strip 52 from their respective spools and roll beneath the roller 70 and through the guides 58 and 74. The interlocked wires and strips, corrugated to an angle of about 45°, pass from the rollers 80 and 84 through the slotted guide 121 extending horizontally to the left into Figure 6.

In Figure 6 there is provided a horizontal metal link chain 123 operating around two horizontally spaced pinions 125 and 127 which are rotatably mounted on the shafts 129 and 131. The chain 123 carries on each link a transversely extending blade 133 extending outwardly and having an outer end in the form of a projection of reduced size extending directly across the blade. At the end of the chain 123 nearest the guide 121 there is provided a gear wheel 135 rotatably mounted on the shaft 137 and meshing with the projections at the outer ends of the blades 133 as the corresponding links of the chain pass around the pinion 127. The shaft 137 of the gear wheel 135 is parallel to the axes of the pinions 125 and 127 and is located at an angle of about 135° relative to the line of centers of the pinions 125 and 127. The gear wheel 135 and the corrugating wheels 80 and 84 are synchronized by being geared together by suitable gearing such as the gears 139, 141 and a connecting chain 143. The chain 123 is driven from the gear 139 through a gear 140 meshing with a gear 128 on the shaft 131 which drives the pinion 127 meshing with the chain 123.

The projections at the ends of the blades 133 are shaped so that when they are moved to the horizontal position of the path of the chain 123, they will form an exact forming die for the interiors of the final right angles parallel sided corrugations of the superimposed wire and strip, as shown in Figure 6. As the corrugated strip and wires are fed from the guide 121 between the gear wheel 135 and the projections on the ends of the blades 133, they carry the corrugations beneath the curved guide member 145 to the point where the corrugations are gathered together to form right angle corrugations over the projections at the ends of the blades 133. This is accomplished by the arrangement by which the blades 133 formed integrally or attached to the links of the chain 123 become parallel in the horizontal paths of movement of the chain 123. The blades 133 extend radially from the axes of the shafts 129 and 131 as they pass around the pinions 125 and 127. The changing of the blades 133 from a radial position to a parallel position as they pass from the pinion 127 brings the tops and bottoms of the corrugations together to form closely spaced right angle corrugations. To further form and complete the formations of the right angle corrugations, there is provided a heavy roller 147 mounted upon the axle 149 which rotates in bearings 151 spring-pressed downwardly by the springs 153. This arrangement causes the roller 147 to roll on the tips of the corrugations as they are held by the projections at the ends of the blades 133 when they are in parallel side-by-side relationship. This rolling insures proper formation of the right angle corrugations of uniform size and shape. The inner surface of the chain 123 is supported by a table or plate 124 beneath the roller 147.

The corrugated wire and strip 155 is carried off the tips of the blades 133 by an upwardly extending incline 157. This incline 157 feeds the corrugated wire and strip 155 over the counter wheel 159 rotatably mounted on the shaft 161. The corrugated wire and strip 155 is yieldingly held against the teeth of the counter wheel 159 by a shoe 163 pivoted on a shaft 165 and spring-pressed in a counterclockwise direction by a tension spring 167.

The counter wheel 159 drives a counter control 169 which, after the passing of a predetermined number of corrugations or a predetermined rotation of the counter wheel 159 through the connection 171, will render effective the severing or cut-off operating mechanism 173 to cause the upper knife 175 to come down and shear the corrugated wire and strip 155 in segments to the length desired. A lower knife 177 is stationary and cooperates with the movable upper knife 175. The movable upper knife 175 is provided with a spring mounted detent plate 179 carrying the detent 181 which enters in between one set of corrugations to momentarily hold the corrugated strip 155 during the shearing operation. The spring-mounted detent plate 179 is anchored onto the lower end of the compression spring 183 having its upper end mounted on the L-shaped bracket 185 fastened to the upper shear 175.

Thus, by this rolling type forming machine I am able to rapidly superimpose and corrugate the numerous wires 44 and the strip 52 in right angle corrugations and shear it in predetermined lengths automatically at a high rate. This produces the proper lengths of corrugated wires and strip economically for succeeding assembly operations.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In a machine for corrugating metal wires and a metal strip together, guide means for bringing the metal wires and the metal strip together in a longitudinal relationship, corrugating wheels having corrugating projections and depressions extending transversely to the wires and the strip and interengaging each other for simultaneously corrugating the superimposed metal wires and metal strip in contact with each other, the projections and depressions of the corrugating wheels when at their nearest positions having clearance less than the combined thickness of the wire and the strip to force the wires and the strip into intimate contact at the tip of each of the ridges of the corrugations in the wire and strip, and a roller located between said guide means and said corrugating wheels having a resilient surface pressing the wires against the surface of the strip received from the guide means and simultaneously contacting all the wires and the surface of the strip for providing their simultaneous uniform advancement.

2. In a machine for corrugating metal wires and a metal strip together, guide means for bringing the metal wires and the metal strip together in a longitudinal relationship, corrugating wheels having corrugating projections and depressions extending transversely to the wires and the strip and interengaging each other for simultaneously corrugating the superimposed metal wires and metal strip in contact with each other, the projections and depressions of the corrugating wheels when at their nearest positions having clearance less than the combined thickness of the wire and the strip to force the wires and the strip into intimate contact at the tip of each of the ridges of the corrugations in the wire and strip, and a roller located between said guide means and said corrugating wheels having a resilient surface pressing the wires against the surface of the strip received from the guide means and simultaneously contacting all the wires and the surface of the strip for providing their simultaneous uniform advancement, and a second guide means located between said roller and said corrugating means for guiding the superimposed wires and the strip to and between the corrugating wheels.

3. In a machine for corrugating metal wires and a

metal strip together, guide means for bringing the metal wires and the metal strip together in a longitudinal relationship, corrugating wheels having corrugating projections and depressions extending transversely to the wires and the strip and interengaging each other for simultaneously corrugating the superimposed metal wires and metal strip in contact with each other, the projections and depressions of the corrugating wheels when at their nearest positions having clearance less than the combined thickness of the wire and the strip to force the wires and the strip into intimate contact at the tip of each of the ridges of the corrugations in the wire and strip, a roller located between said guide means and said corrugating wheels having a resilient surface pressing the wires against the surface of the strip received from the guide

means and simultaneously contacting all the wires and the surface of the strip for providing their simultaneous uniform advancement, and a supporting means located on the opposite side of said strip from said wires and said roller.

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