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DOUBLE UNIT SPIRAL SPRING DRIVE

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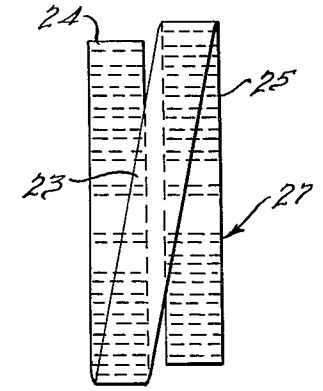

FIG. 1.

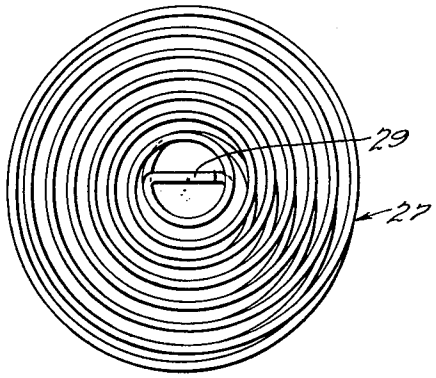

FIG. 2.

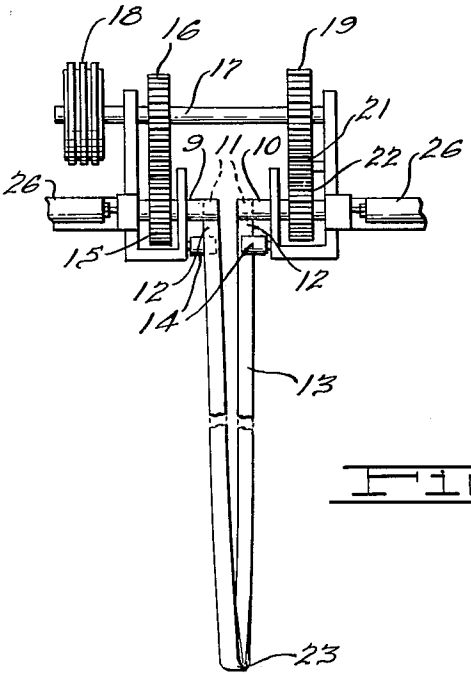

FIG. 4.

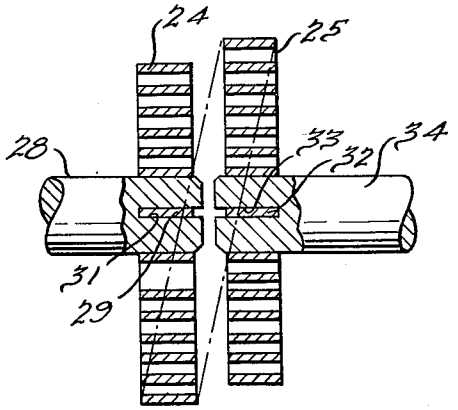

FIG. 3.

INVENTOR.
Howard J. Thomsen.
BY
Harness, Dickey & Pierce
ATTORNEYS.

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DOUBLE UNIT SPIRAL SPRING DRIVE

Howard J. Thomsen, 650 Ardmoor Drive, Birmingham, Mich.

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This invention relates to spring drives and particularly to a spring for a drive having two spirally wound portions adjacent to each other interconnected by the outer turn disposed diagonally therebetween.

Spiral springs have been constructed heretofore from flat stock wound outwardly from a diametrically disposed securing end at the center and terminating at the outer end with an angular securing portion. The force exerted by the spiral type spring depends upon the number of turns and the cross sectional area of the strap material from the which the spring is constructed. As the spring becomes larger in diameter with the increasing number of turns, the power in the outer turn is reduced and a more compact and powerful spring for the diameter thereof is provided by winding adjacent units from a single length of material in the opposite hand with the outer turns connected by a diagonal portion between the units to produce the unit spring.

A length of material is selected to produce the proper number of turns in each of the units with the diagonal section disposed therebetween. The ends of the strip are placed adjacent to each other in slots in a pair of rotatable shafts, one of which is driven in one direction and the other rotated in the opposite direction at the same rate of rotation if both springs are to be of equal strength. Hold down and guide structure is provided adjacent to the rotatable arbors so as to force the strap material to be bent around the arbors as they are rotated to wind the ends of the material in the opposite direction thereon with a straight securing end at the center of each spring unit. After the units are wound as tight as possible with the diagonal portion of the strap material therebetween, the arbors are moved outwardly of each other to have the ends released from the central holding portion at the center of the units so that the spring may drop from the winding machine.

Since each of the units are wound in a direction opposite to the other, the winding of one unit from the center will carry the winding action across the outer diagonal turn to the second unit which is wound from the outside inwardly to provide an increased rotatable force on a shaft having a slot in the end which receives the central diametrical securing end at the center of the units. The spring produces a compact unit for connecting aligned shafts to apply a force from one shaft through the spring unit to the other shaft to produce a drive thereto through the spring. This is a new concept in providing a drive through a spring from one shaft to a second shaft which is disposed in aligned relation to the first shaft.

Accordingly, the main objects of the invention are: to form a drive between two aligned shafts through a spring having two spiral units wound in opposite directions to each other and interconnected by a portion of the outer turn of the strap from which the units are wound; to form a spring from a pair of spirally wound units constructed from a hairpin shaped length of stock by winding the ends thereof on aligned arbors in opposite directions at the same speed of rotation to have the same number of turns in each unit which are interconnected by the diagonally disposed outer portion of the stock; to provide a pair of spiral wound spring units interconnected by an outer turn for joining a pair of aligned shafts in a manner to have the rotation of one shaft apply a force in rotation to the other shaft in the same direction and, in general, to provide a spiral spring having two adjacent

units which are wound simultaneously in the opposite direction and which is simple in construction, positive in operation, and economical to manufacture.

Other objects and features of novelty of the invention will be specifically pointed out or will become apparent when referring, for a better understanding of the invention, to the following description taken in conjunction with the accompanying drawing, wherein:

FIGURE 1 is a view in elevation of a spring of a double spiral unit type embodying features of the present invention;

FIG. 2 is a side view of the spring illustrated in FIG. 1;

FIG. 3 is a sectional view of the structure illustrated in FIG. 2, with the ends of the spring disposed on the ends of adjacent shafts, and

FIG. 4 is a view of a machine for winding the spring illustrated in FIGS. 1 to 3.

The spring of the present invention consists of two spirally wound units having aligned centers and an outer turn which is continuous and diagonally disposed from one unit to the other. The ends of the springs are located on the center line of each spiral unit and the units are wound in the opposite direction so that when one unit is wound, the winding will carry over to the other unit which is also wound.

As illustrated in FIG. 4, a pair of axially movable rotatable arbors **9** and **10** have slots **11** in their adjacent end for receiving the ends **12** of a hairpin shaped length of spring strip stock **13**. The ends **12** are disposed between hold down elements **14** which maintain the strip in a horizontal plane as the arbors **9** and **10** are rotated in opposite directions. Arbor **9** is driven by a gear **15** from a gear **16** secured to a driven shaft **17** driven by a belt and pulley drive **18**. The shaft also drives a gear **19** through an idler or reversing gear **21** to drive a gear **22** connected to the arbor **10** for driving it in the opposite direction to the gear **15** and arbor **9**. When driven from the shaft **17**, the arbors **9** and **10** operate at the same speed and in opposite directions to wind the ends **12** thereon until the outer turn **23** is disposed on a diagonal between the wound units **24** and **25**. The piston rod of rams **26** is then withdrawn within the cylinders and the arbors **9** and **10** are moved apart to permit the spring unit **27**, as illustrated in FIGS. 1 to 3 inclusive, to drop from the arbors. The arbors are then moved to adjacent positions and a new hairpin shaped length of stock **13** has its ends **12** disposed beneath the hold down element **14** and inserted in the slots **11** in the end of the arbors **9** and **10** which are rotated in opposite directions to wind another spring composed of two spiral units having its ends terminating on a common center.

The spring unit **27** thus constructed has the unit **24** connected to a drive shaft **28** by having the central diametrically extending end **29** disposed within a slot **31** in the end thereof. The unit **25** has its diametrically extending end portion **32** disposed in a slot **33** in a driven shaft **34**. The rotation of the shaft **28** in a clockwise direction will wind up the turns of the spring unit **24** and apply a force to the diagonal outer turn **23** to wind up the spring unit **25** inwardly from the outer turn to thereby build up a substantial force through both spring units for rotating the shaft **34**. Similarly, when the shaft **34** is rotated in a counterclockwise direction, the spring unit **25** is wound to produce a pulling force on the diagonal outer turn portion **23** to wind up the spring unit **24** to apply a counterclockwise rotational force to the shaft **28** when it is to be driven by the spring.

Thus a very compact type of spring is produced through the provision of two units wound in opposite directions with the terminal ends of the spring disposed on the diameter of the inner turns of the units. This substantially decreases the diameter of the spring and pro-

vides a saving in the length of stock due to the smaller diameter of the turns of each unit.

What is claimed is:

1. A spring drive including a spring interconnecting a pair of substantially aligned shafts, said spring comprising a pair of adjacent spirally wound units containing a plurality of turns joined by an outer turn diagonally disposed thereacross, the ends of the spring being disposed at the center of the units, said pair of substantially aligned shafts having adjacent ends secured to the ends of said units.

2. A spring drive including a spring interconnecting a pair of substantially aligned shafts, said spring comprising a pair of adjacent spirally wound units containing a plurality of turns joined by an outer turn diagonally disposed thereacross, diametrically extending ends on each unit at the center thereof, said pair of substantially aligned shafts having adjacent ends connected to the ends of the units.

3. A spring drive including a spring interconnecting the ends of a pair of substantially aligned shafts, said spring comprising a pair of adjacent spirally wound units containing a plurality of turns joined by an outer turn diagonally disposed thereacross, one unit being wound in one direction, the other unit being wound in the opposite direction, and diametrically extending ends at the center of the units, said pair of substantially aligned shafts having slotted ends engaged by the ends of the units.

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