

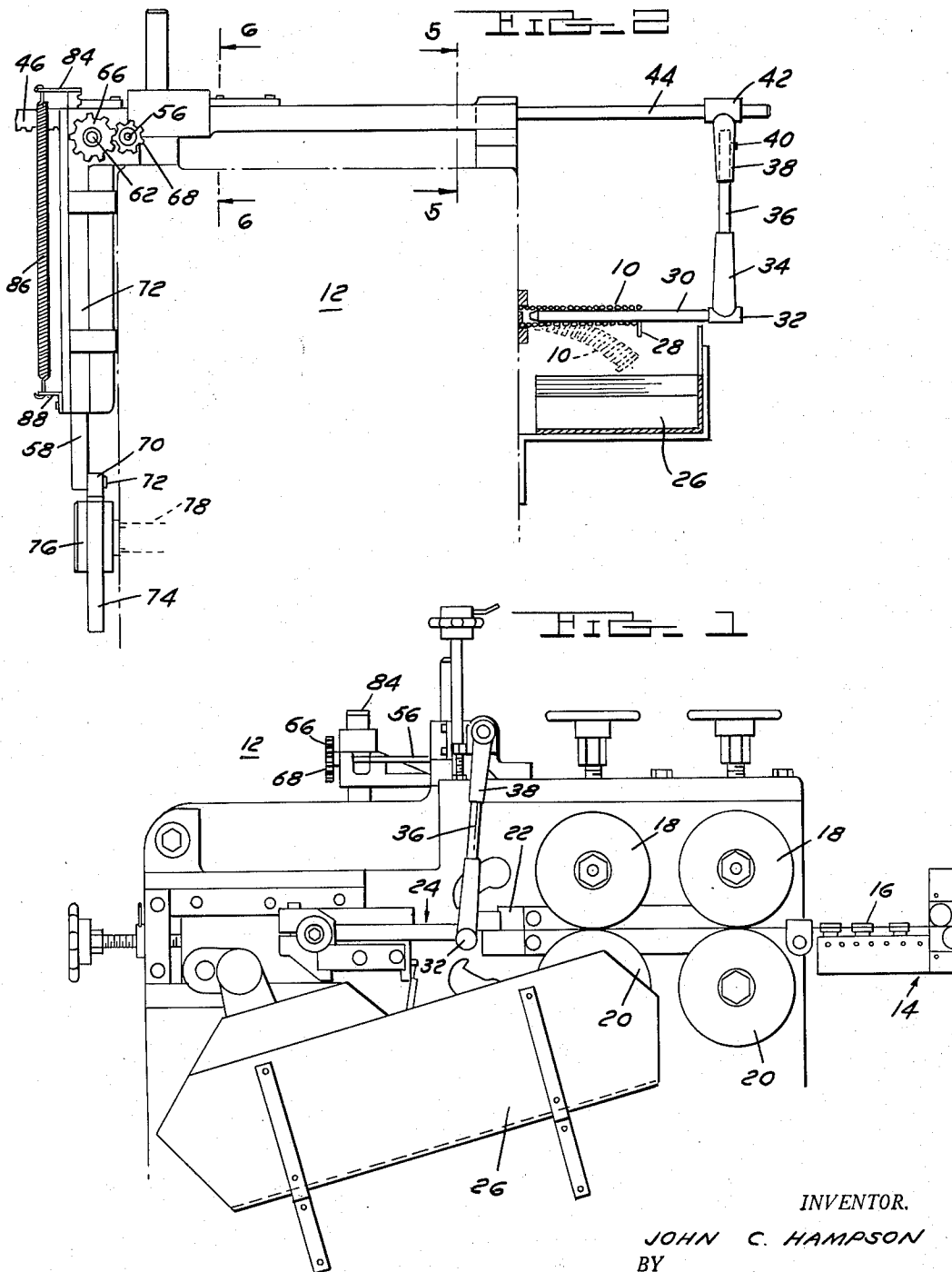
May 22, 1956

J. C. HAMPSON
ATTACHMENT FOR WIRE COILING MACHINE

2,746,512

Filed June 18, 1951

3 Sheets-Sheet 1



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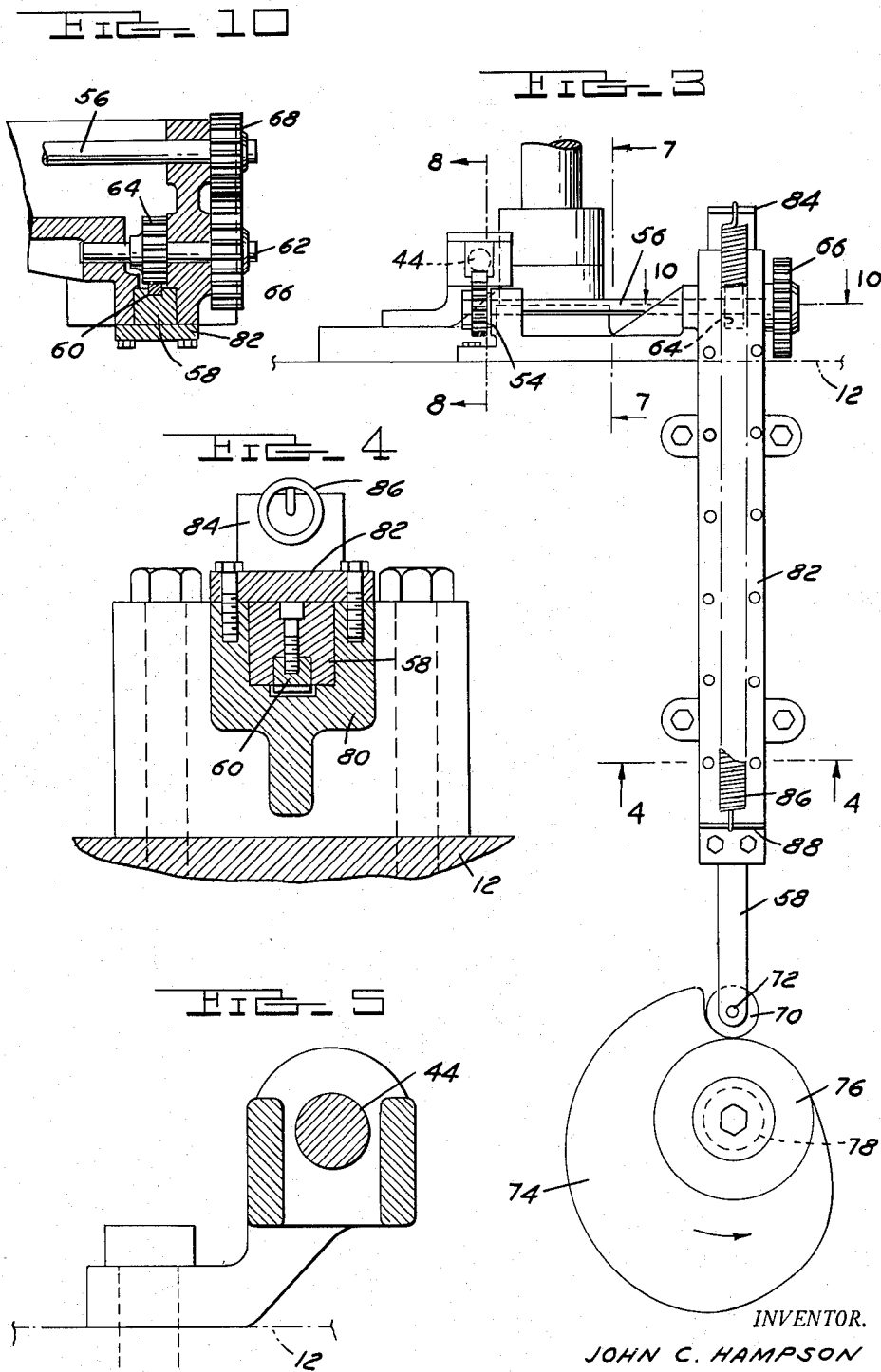
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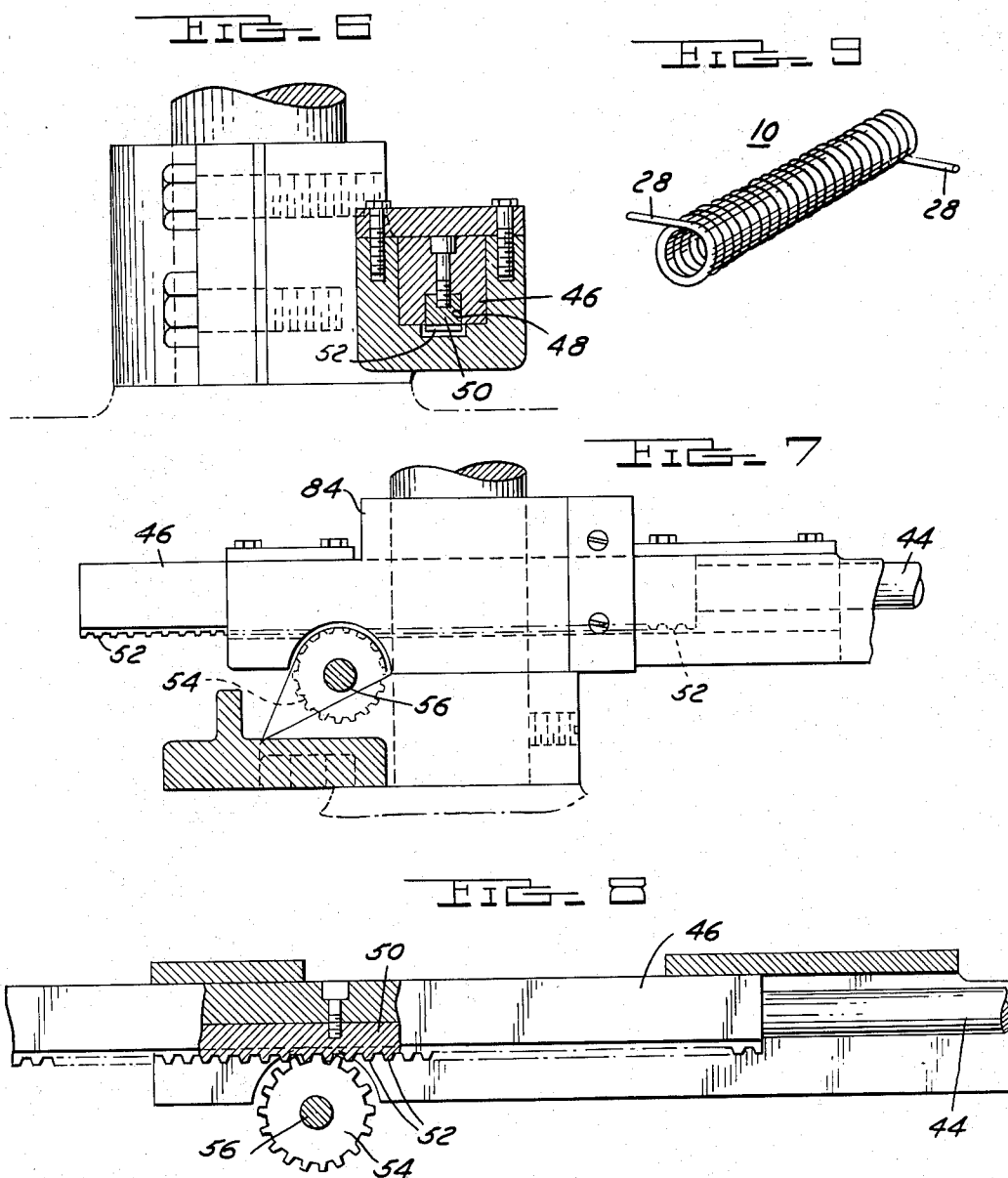
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ATTACHMENT FOR WIRE COILING MACHINE

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3 Claims. (Cl. 153—65)

This invention relates to wire coiling machines and particularly to improvements for supporting the coiled sections of wire formed by the machine.

In conventional wire coiling machines, it has been the practice to take straight lengths of wire and as convolutions are successively formed therein to project the resulting coiled wire section in unsupported condition from the machine. After a desired axial dimension of a coiled length of wire is formed, it is cut off from the balance of the straight wire and allowed to fall away from the machine into a receptacle for future use. When long lengths of coiled sections are thus formed, the unsupported projected condition of wire from the machine causes it to bend under its own weight, and the resulting extra strains on the convolutions very frequently distort the coiled wire out of its desired shape. As a result, in the production of such wire coils, a considerable number of the wire coils have been inaccurately formed and either require such coils to be rejected or impose an added difficulty to the mounting of coils in an assembly of parts.

An important object of this invention is to improve the operation of wire coiling machines by providing a support for the coiled section of wire as it is formed and projected from the machine, which support is timed to move out of the coiled section at the time it is cut off from the balance of the wire. Another important object of the invention is to improve the formation of coiled sections formed by a wire coiling machine by providing a movable supporting arbor or core for the coiled wire sections which is disposed in offset relation to the side of the machine from which the coiled wire sections are projected and is movable toward the side of the machine to receive the convolutions of the coiled section as they are formed and is movable away from the side of the machine to permit each formed and severed coiled section to fall. An important feature of the invention is the operating connection between the core member and the moving parts of the machine which governs the movement of the member in timed sequence to the operation of the machine.

Various other objects, advantages and meritorious features of the invention will become more fully apparent from the following specification, appended claims and accompanying drawings wherein:

Fig. 1 is a front elevation of the upper portion of a conventional wire coiling machine and showing the location of the wire coil supporting member of the present invention,

Fig. 2 is a side elevation of the upper portion of the machine of Fig. 1 showing the disposition of the parts of the present invention on the back, top and front sides of the machine of Fig. 1,

Fig. 3 is a back view of the improvement and showing the drive means therefor,

Fig. 4 is an enlarged horizontal cross sectional view taken along line 4—4 of Fig. 3,

Fig. 5 is an enlarged vertical cross sectional view taken along line 5—5 of Fig. 2,

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Fig. 6 is an enlarged vertical cross sectional view taken along line 6—6 of Fig. 2,

Fig. 7 is an enlarged vertical cross sectional view taken along line 7—7 of Fig. 3,

Fig. 8 is an enlarged vertical cross sectional view taken along line 8—8 of Fig. 3,

Fig. 9 is a perspective view of a coiled spring wire product formed by and ejected from the machine; and

Fig. 10 is a top fragmentary view of the gearing through which one of the rack bars of the machine drives another rack bar thereof.

In the embodiment of the invention illustrated in the drawings, there is shown in Figs. 1 and 2 the upper portion of a wire coiling machine which is of conventional design and adapted to receive straight wire, shape the wire into coils of various lengths, and cut off the coiled section from the balance of straight wire and eject the coiled wire product from the machine. An example of a coiled wire product capable of being formed by such a machine is shown at 10 in Fig. 9. The machine is adjustable to form coiled wire products of varying lengths. It is the production of longer coiled lengths with which this invention is primarily concerned.

The front side of a conventional wire coiler machine is illustrated in Fig. 1 and generally indicated by the reference character 12. It comprises such operating parts as a wire conditioner and straightener generally indicated at 14 through which wire stock from any suitable source of supply (not shown) is fed. An advancing straight length of wire passing through the conditioner is indicated at 16. After leaving the conditioner 14, the wire stock is passed between two sets of upper and lower coating feed rollers 18 and 20 and thence through a guide 22 against a coiler block which is generally indicated at 24. The latter imparts a helical formation to the wire stock fed thereagainst and projects the coiled wire laterally from the front side of the machine as shown in Fig. 2. After a predetermined length of wire has been coiled and projected in this manner, as regulated by conventional adjustments on the machine, it is cut off at its root end and allowed to fall into an inclined collector or receptacle 26 where at periodic intervals the formed coiled sections can be removed.

When relatively long lengths of coiled wire are formed in this manner and progressively projected laterally from the front side of the machine, the weight of the coiled section causes it to arch downwardly as shown in dotted outline in Fig. 2. This places the individual coils under some stress which may distort them but particularly places the root end of the coiled wire section under such strain that when cut off it may be deformed or bent out of the desired position. Coils formed by such machines usually provide a laterally projecting short straight section at each end thereof as indicated at 28 in Fig. 9 which are used to fasten the coil in place in the assembly for which it is intended. It is the straight end section which is cut off and its adjacent convolution that are likely to be deformed or permanently bent out of shape by the dangling weight of the projected coiled wire. The deformation may be of such an extent, especially for long coiled sections, as to cause the product to be rejected, but in any event the resulting deformation of the cut off end of the coiled section will interfere with its final installation in an assembly of parts requiring additional labor and time to properly install the section.

The present invention has to do with a provision for relieving the coiled section of wire as it is formed from such strain. For this purpose there is provided a substantially horizontal supporting member in the form of a cylindrical arbor or core 30 upon which the convolutions of the wire coil are axially advanced as the coiled section is being formed. As shown in Fig. 2, the arbor or core 30 is positioned on the front side of the machine

with its axis extending perpendicularly thereto and in alignment with the coils of the wire as they are formed by the machine. The arbor preferably has a diameter slightly less than the internal diameter of the coiled wire being formed by the machine. The inner or nearest end of the arbor to the front side of the machine is left free and unsupported so that as the convolutions of the coiled wire are formed they freely slide over the arbor toward its outer end. Means is provided, as hereinafter described, for supporting the opposite or outer end of the arbor in the desired position and for axially bodily shifting the arbor in timed sequence with the production and ejection of coiled springs from the machine.

As shown in Fig. 2, the outer end of the arbor or core 30 is received in a socket member 32. Preferably the arbor is detachably received in the socket for convenient removal therefrom in order to replace one size of arbor for another size to accommodate coil springs of different diameters. The socket 32 forms part of a tubular section 34 slidably fitting the lower end of a vertically extending arm 36. The upper end of the arm is telescopically received in a sleeve 38 similar to sleeve 34 and means such as a set screw 40 may be provided for detachably mounting the arm in the sleeve. The upper sleeve 38 is secured to a collar 42 which is removably slidably fitted upon the forward end of an elongated horizontal extending rod 44 and is normally secured thereto for joint movement therewith.

The rod 44 extends rearwardly across a part of the top of the machine 12 and is secured at its rear end to a rectangularly shaped bar 46 as shown in Figs. 6, 7 and 8. The bar 46 is provided with a downwardly opening groove 48 in which is secured a rack member 50 having teeth 52 arranged to engage the teeth of a pinion 54. It is evident from the description of the mounting for the arbor thus far made that rotation of the pinion 54 in one direction or the other will cause the bar 46, rod 44 and the arbor 30 to reciprocate back and forth relative to the plane of the front side of the machine.

In the illustrated embodiment of the invention, the arbor supporting mechanism previously described is driven from a rotated part of the machine located on the rear side thereof. The pinion 54 is fixed to a shaft 56 extending transversely to the path of travel of the rack bar 46 and herein shown as being located under the rear end of the rack bar. The rack bar 46 is operatively connected to the upper end of a vertical reciprocating rack bar 58 positioned near but in spaced relation to the rear side of the machine and extending downwardly from the top thereof. The rack bar 58 may be constructed similar to the rack bar 46 and be provided with a rectangular cross section and a recessed toothed member 60 forming the rack for the bar.

The upper end of the vertical rack bar 58 is operatively coupled to the transverse shaft 56 through gearing. This comprises a stub shaft 62 disposed between the upper end of the vertical rack bar and the transverse shaft and carrying two gear wheels, a smaller gear wheel 64 arranged to engage the teeth of the rack 58 and a larger gear wheel 66 positioned in exposed condition for convenient replacement. The larger gear 66 meshes with a gear 68 carried on the adjacent end of the transverse shaft 56, thus completing the operative connection between the vertical rack bar and transverse shaft and providing the proper direction, stroke and desired speed of movement of the arbor 30. The exposed condition of the two meshing gears 66 and 68 enables them to be readily replaced by gear wheels of different dimensions in order to vary the stroke length of the arbor depending upon the axial dimension of the coiled product.

The lower end of the vertical reciprocating rack bar 58 is provided with a roller 70 journaled on a pin 72 and arranged to engage a cam 74. The cam 74 is demountably supported on an adaptor clamp or hub 76

which in turn is secured to a shaft 78 entering the machine and operatively connected to a rotating part thereof in order to operate in timed synchronism with the production and ejection of the coil springs. It is evident that rotation of the cam in the direction of the arrow in Fig. 3 will cause the roller to ride up and down on the non-circular periphery thereof and reciprocate the vertical rack bar 58. This movement of the rack bar will cause the shaft 56 to rotate first in one direction and then in the other thereby moving the arbor 30 inwardly and outwardly relative to the front side of the machine.

The vertically reciprocating rack bar 58 is partially enclosed within an elongated channel-shaped housing 80 and guided thereby for its vertical travel. The channel of the housing is arranged to open rearwardly of the machine and is provided with a flat backup plate 82 bridging the outer edges of the channel and being bolted or otherwise secured thereto as shown in Fig. 4. The upper end of the rack bar projects above the housing and is provided with a rearwardly extending arm 84. The upper end of the coil spring 86 is secured to the arm 84 and the opposite end of the coil spring is secured to a fixed arm 88 secured to and projecting rearwardly from the lower end of the backup plate 82. The relation of the coil spring 86 to the housing and the vertical operating rack bar 58 is such that it yieldingly urges the latter downwardly causing the roller 70 to continuously engage the periphery of the cam 74.

What I claim is:

1. In a wire coiling machine wherein a length of wire stock is fed against an aligned coiler block which coils the wire and forms a helically coiled spring which has a longitudinal axis extending laterally of the direction at which the wire stock engages the coiler block and which forms the spring by advancing successive rotating coils laterally outwardly thereof, the improvement which comprises a spring supporting rod-like core, support means for rigidly supporting said core as a cantilever in parallelism with said longitudinal axis of said spring with the free end of said core directed toward said coiler block, means for reciprocating said support means in parallelism with said longitudinal axis to move said core between an inward position and an outward position, the free end of said core when at said inward position being disposed in close proximity to but longitudinally spaced from said coiler block to facilitate free sliding delivery of the advancing successive rotating coils of the spring on the core to prevent deformation of the spring, the free end of said core when at said outward position being spaced from the outer end of the resultant coiled spring to permit free falling of the spring when the inner end of the spring is severed from the wire stock.

2. A wire coiling machine in accordance with claim 1 wherein said core is removably mounted on said support means and wherein said support means includes adjusting means for initially setting said core at a predetermined longitudinal distance from said coiler block and at a predetermined elevation with respect thereto.

3. A wire coiling machine in accordance with claim 2 wherein said means for reciprocating said support means includes a cam, a cam roller means operatively engaging said cam, a rack bar on said cam roller means, a rack member on said support means, and a shaft and gear transmission means operatively interconnecting said rack bar and said rack member.

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