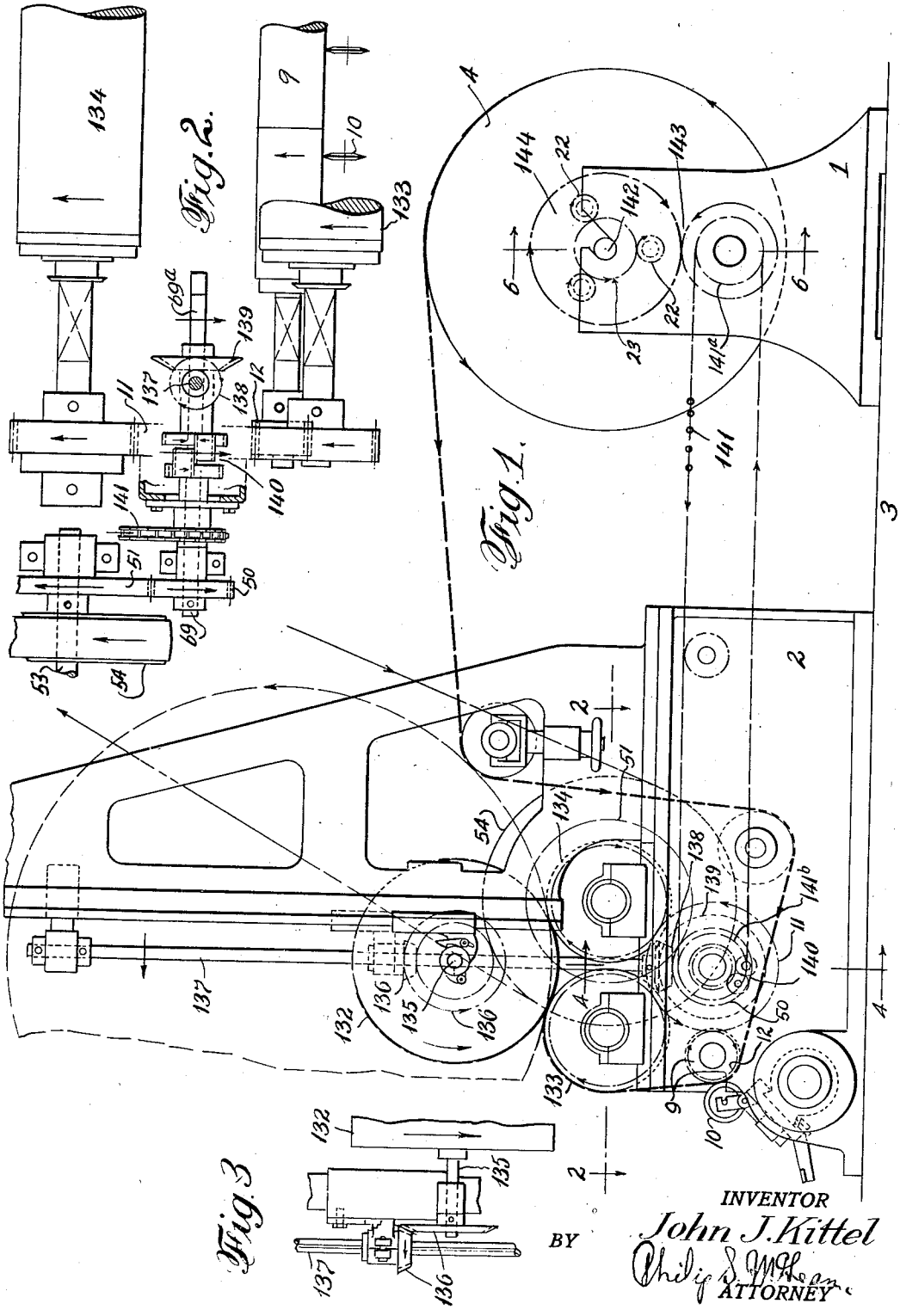
Aug. 17, 1937. J. J. KITTEL 2,090,130

SLITTING AND WINDING MACHINE

Filed May 18, 1931 2 Sheets-Sheet 1

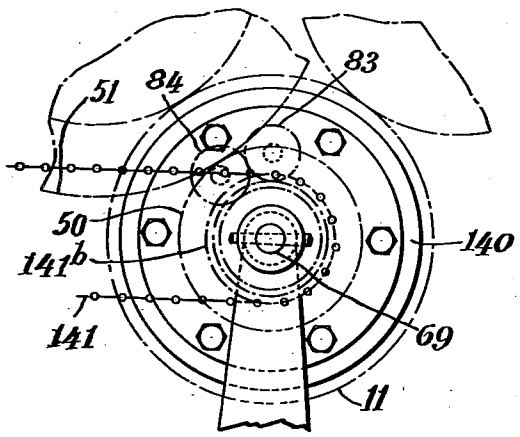


Aug. 17, 1937. J. J. KITTEL 2,090,130

SLITTING AND WINDING MACHINE

Filed May 18, 1931 2 Sheets-Sheet 2

Fig. 5.



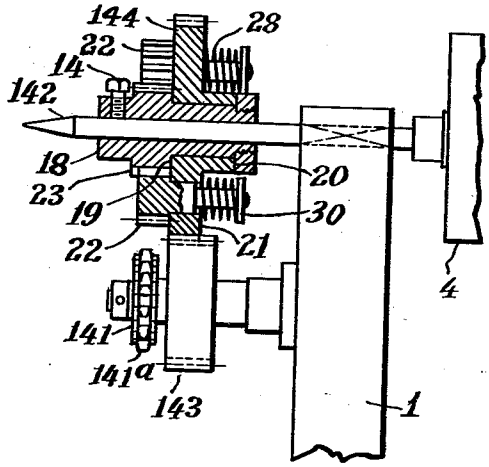
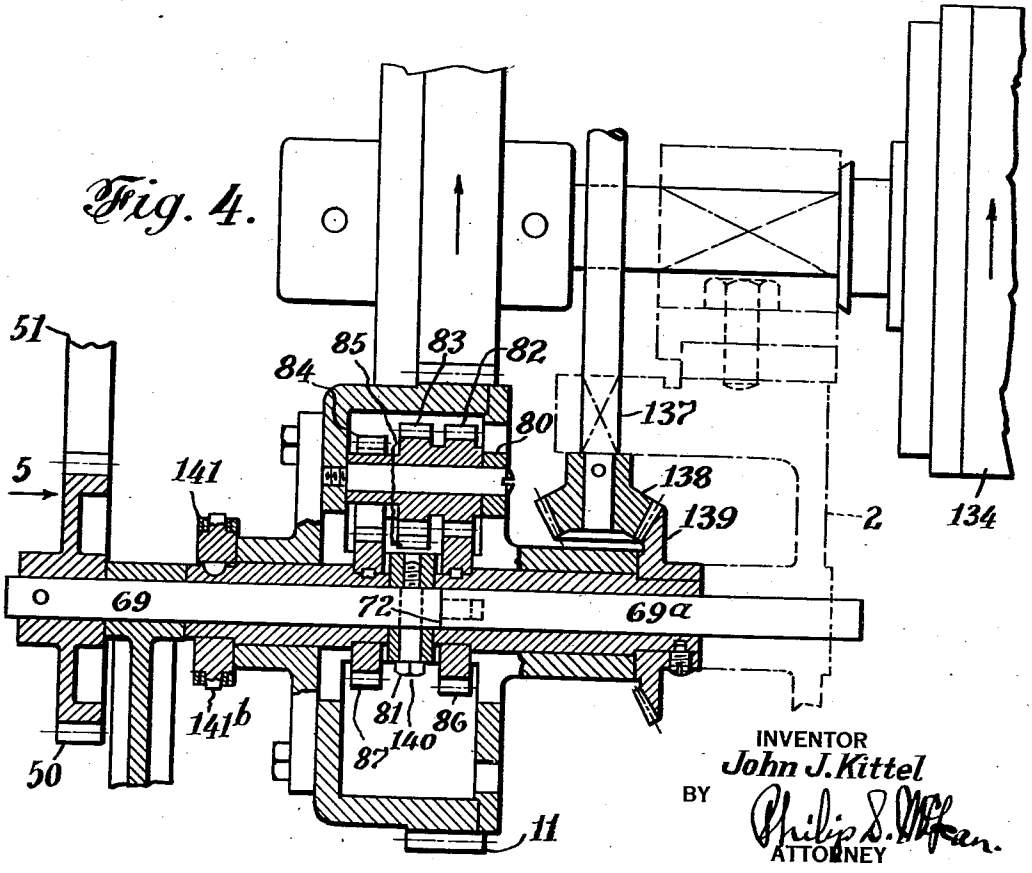


Fig. 6.

Fig. 4.



INVENTOR
John J. Kittel
BY
Philip S. Mahan
ATTORNEY

Patented Aug. 17, 1937

2,090,130

UNITED STATES PATENT OFFICE

2,090,130

SLITTING AND WINDING MACHINE

John J. Kittel, St. Albans, N. Y.

Application May 18, 1931, Serial No. 538,096

5 Claims. (Cl. 242—66)

This invention relates to winding and rewinding operations, more particularly to slitting and winding.

Special objects of the invention are to accomplish the winding of web and strip material and particularly the slitting and rewinding of material, under constant tension, into rolls of substantially uniform compactness, and to provide simple, practical and efficient apparatus for effecting such purposes.

The drawings accompanying and forming part of this specification illustrate one of the preferred embodiments of the invention.

Fig. 1 is a broken side elevation illustrating the invention in a form of center and "surface winder" machine;

Fig. 2 is a broken, sectional and partial plan of the parts appearing substantially on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary detail, illustrating the drive of the rewinding roll in Fig. 1;

Fig. 4 is a vertical sectional view on the center line of the shaft upon which the double regulating unit is mounted, as appearing on substantially the plane of line 4—4 of Fig. 1.

Fig. 5 is a broken end view of the double regulating unit, as viewed looking in the direction of the arrow 5 in Fig. 4.

Fig. 6 is a broken part sectional view of the spring tensioned differential as taken on substantially the plane of line 6—6 of Fig. 1.

The center and surface winder slitting machine shown in Fig. 1, consists in the main, of the two mill roll stands 1 and 2, mounted on base 3, one of them serving as a mount for the mill roll 4 and the other as a mount for the rewinding roll 132. The platen roll 9 with which the score cutter or cutters 10 cooperates, or cooperate, is driven by gears 11, 12 from a special double regulating unit indicated generally at 140. A special spring tensioned differential 144 is shown mounted directly on the mill roll shaft 142, consisting of a gear rotatable between shoulders 19, 20 on a hub sleeve 18 fixed on the mill roll shaft by set screw 14. This gear carries the intermediate pinions 22 having hubs 21 journaled in the body of the gear and in mesh with a central gear 23 fixed on the hub 18. The gear 144 carrying these epicyclic pinions 22 is shown in mesh with a gear 143 carrying a sprocket pinion 141*a* engaged by a drive chain 141 extending from a drive sprocket 141*b* on the hub of the double compensating unit 140, Figure 4.

For control purposes, the intermediate or epicyclic pinions 22 are tensioned against the face of the supporting gear 144 by springs 28 held by adjustable nuts or abutments 30. Adjustment of these nuts effects individual adjustment of the spring tension and hence the amount of "drag" on the three pinions. The sum of this "drag" is the measure of tension exerted and hence governs the tension applied to the web in the winding operation. As this drag is proportioned among the three pinions, the wear and friction on each of the pinions can be kept low and by increasing the number of pinions, the load on any individual pinion may be kept so light as to eliminate any unreasonable wear or strain.

The shaft 69, Figures 1 and 4, is shown as sectionalized at 72, providing an outer power section connected by gears 50, 51, with shaft 53 on which the drive pulley 54 is mounted.

At the power shaft, the applied power is divided and compensation for effecting uniform tension of the web is accomplished by the special double-acting form of regulator shown in Figure 4, as comprising a spider 80 fixed on the power section of shaft 69 by the key bolt 81, said spider carrying two sets of planetary pinions 82, 83 and 84, 85, each set being unitary, as illustrated and mounted in side-by-side relation in the spider with the inside pinions 83, 85 in mesh and the outer pinions 82 and 84 respectively, in mesh with gears 86, 87, fast on the hubs of gear 139 and sprocket pinion 141*b*, which drive respectively to the upper winding roll shaft 135 and the unwinding or mill roll shaft 142.

An important special feature of the dual drive compensating unit just described, is that the gears 86, 87, are of different diameters, to provide at all times, a differential relation as between the two power take-off sides of the unit. In the illustration, the gear 86, which transmits power to the upper winding roll drive, is of larger diameter than the gear 87 carrying power to the unwinding roll drive, the effect of which is to maintain a differential relation at all times including that at which the rolls are of approximately the same size, preventing the so-called "locking" action existing in earlier winding machines when the reversely acting rolls approach conditions of equal diameter.

The several views illustrate a center and surface winder form of slitter, in which the take-up roll 132 rides on the backing rolls 133, 134 and in which the winding shaft 135 is driven by the vertically rising bevel gearing 136, operated by vertical shaft 137, which is driven at the bottom by the bevel gears 138, 139, the latter of which is governed by the double regulating unit 140.

From the other side of this double regulating unit, a sprocket gear drive 141 is extended to drive the take-off roll shaft 142, to the gearing 143 and at this take-off roll shaft, one of the planetary control units 144 is provided.

The drawings show one of the possible uses of the invention and illustrate the fact that the same may be usefully employed wherever winding is to be effected with a continuously uniform tension and without the locking effect when the opposing rolls are approximating equal diameters. These illustrate also, that the invention is applicable to either surface winding or center winding, or to combinations of surface and center windings. It should be clear also, that the uniformity of tension without heavy frictional losses, enables continuous high speed winding and in rolls practically unlimited in size. The latter feature is particularly important in center winding operations, this invention making it possible to produce practically any size roll on a center winder machine, avoiding the necessity to resort to the more expensive surface winders for the large size rolls, as has been found necessary heretofore. The invention also is equally applicable to either constant or variable web speed machines. The regulator, whether of the single type disclosed in Figs. 1 and 6 or of the double type shown in Figs. 4 and 5 is subject to the "pull" of the web and in effect, continuously "feels" the tension of the web, reacting accordingly to automatically slack off or take up on the unwinding roll to maintain a constant uniform tension on the web at the winding roll, regardless of the varying roll sizes and preventing any "locking" action as the rolls approximate equal diameters. In addition to producing more uniformly compact rolls, the slitting action actually is better because of the constancy of web tension at all times, which enables the slitters to operate at best efficiency. This is particularly true of the shear cut form of slitter operation. The views illustrate the possibility of interchangeability and the suitability of the invention to many different kinds of uses. The tension regulator is of a unitary form adapted to be placed and used in various relations and wherever placed, serves the purpose of dissipating or carrying off the excessive energy accumulating with changing relations from increasing and decreasing diameters, such as result from winding from one roll to another. The portability of the tension regulator unit is especially important, enabling such a unit to be quickly taken off or applied in any given location and one such unit to be quickly interchanged for another.

The invention is of broad scope and the terms employed herein should therefore be construed in a descriptive rather than in a limiting sense, except possibly for limitations that may be required by the state of the prior art.

What is claimed is:

1. In web winding and unwinding apparatus, the combination of take-up and take-off roll shafts, backing rolls on which the roll on the take-up shaft rides, means for driving the rising take-up roll shaft, differential compensating gearing for driving said means and driving connections extending from said differential compensating driving means to said take-off roll shaft.

2. In web winding and unwinding apparatus, the combination of winding and unwinding roll shafts and a web extending between said shafts, a gear train interposed between said shafts and governed according to travel of the web and varying roll diameters on the winding and unwinding roll shafts, said gear train including one set of gears coupled with the winding roll shaft and a second set of gears coupled with the unwinding roll shaft, said two sets of gears being directly connected and having slightly different gear ratios respectively to the roll winding and unwinding shafts with which they are coupled and means for yieldingly tensioning said interposed gear train between the winding and unwinding roll shafts to compel said differential ratio gear sets to drive said winding and unwinding roll shafts with substantially constant tension on the web through varying roll diameters.

3. Apparatus for winding a web under substantially constant tension comprising in combination, a take-up roll shaft, means for driving the same at substantially constant speed, a supply roll shaft and differential gear mechanism governed by the web travel from the supply roll shaft to the take-up shaft and operated thereby to relieve excess of pull created by the increase in size of the roll on the constantly driven take-up roll shaft to maintain substantially constant tension on said web.

4. A combination center and surface winder comprising backing rolls, a take-up roll riding on said backing rolls and having a center drive shaft, constant surface speed drive gearing to said backing rolls and variable speed drive gearing to said center shaft, including self-compensating gearing for automatically driving said center shaft at a speed to maintain constant surface speed of the take-up roll at the points of riding engagement with the backing rolls.

5. A combination center and surface winder comprising backing rolls, a take-up roll riding on said backing rolls and having a center drive shaft, constant surface speed drive gearing to said backing rolls, variable speed drive gearing to said center shaft, including self-compensating gearing for automatically driving said center shaft at a speed to maintain constant surface speed of the take-up roll at the points of riding engagement with the backing rolls, a mill roll for supplying the web to the take-up roll and a shaft for said mill roll, said compensating gearing including differential drive connections from said mill roll shaft to the gearing operating the center shaft of the take-up roll.

JOHN J. KITTEL.