

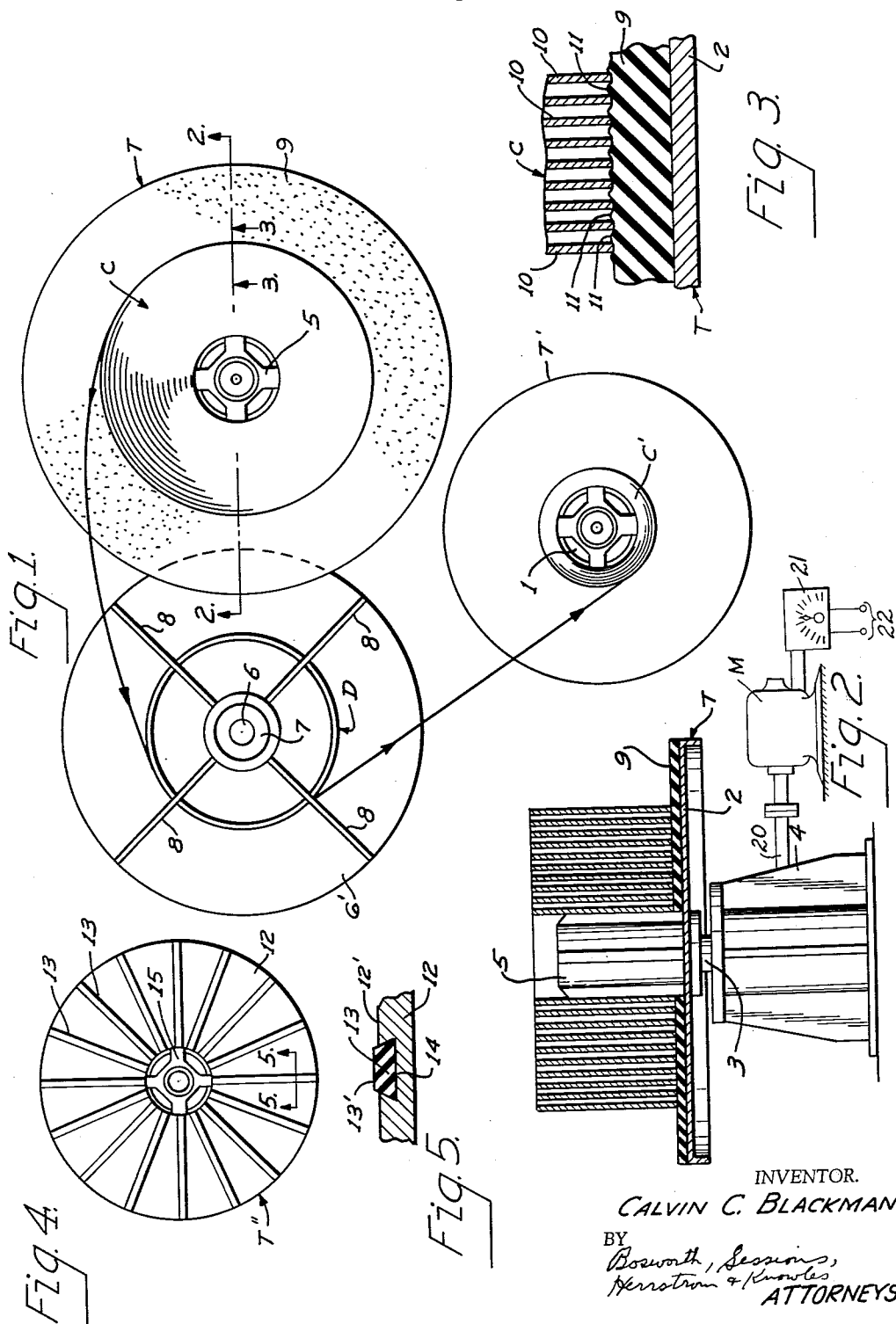
Jan. 2, 1962

C. C. BLACKMAN

3,015,455

OPENED COIL SUPPORTING TURNTABLE

Filed Aug. 11, 1959



INVENTOR.
CALVIN C. BLACKMAN
BY
Roseworth, Sessions,
Herrstrom & Knowles
ATTORNEYS.

1

2

3,015,455
OPENED COIL SUPPORTING TURNTABLE
Calvin C. Blackman, Bay Village, Ohio, assignor to
Lee Wilson, Cleveland, Ohio
Filed Aug. 11, 1959, Ser. No. 832,984
8 Claims. (Cl. 242—78.6)

This invention relates to opened coil annealing and more particularly to apparatus for supporting an opened coil for rotation about its axis during the recoiling thereof back into tight wound form.

In the "opened coil" annealing of strip metal as described and claimed in the Lee Wilson and Edwin A. Corns United States patent application Serial No. 639,939, filed February 13, 1957, a tight wound coil of strip metal as it comes from the rolling mill is rewound into opened coil form with the laps or convolutions of the coil spaced apart so that heated atmosphere may be forced therethrough for annealing or other heat treating purposes. After the annealing operation, such opened coils must be rewound back into tight coil form for subsequent handling or shipment.

To effect such recoiling the annealed opened coil is placed on an opened coil turntable and the outer end led to a mandrel on a tight coil turntable, the axes of both of said turntables being vertical, and the coil is rewound into tight coil form, suitable means being provided for imposing back tension on the strip approaching the tight coil turntable so that the desired tightness of winding may be effected.

It is, of course, desired to effect this tight coiling of the opened coil as rapidly as possible. However, where the opened coil is supported on the metal face of a turntable, difficulty is sometimes experienced because, if the coil is somewhat eccentric, the resulting unsymmetrical distribution of the mass of the coil on the turntable may result in lateral shifting of the spaced apart laps due to the action of centrifugal force during rotation of the turntable. Such lateral shifting is not encountered in tight wound coils but in opened coils having spaced apart laps, such shifting or sliding, once started, becomes progressively worse because the out-of-balance condition that results becomes progressively worse. To prevent this very undesirable shifting of the opened coil on its turntable during tight coiling it is necessary to reduce the speed of rotation of the turntable to such a degree that output of the plant is seriously interfered with.

It is an object of the present invention to provide means for retaining an opened coil having spaced apart laps on a turntable during rotation thereof and to prevent side-wise or lateral slipping or sliding of the laps thereof on the turntable surface due to eccentric or unbalanced conditions of the opened coil. The above and other objects of my invention will appear from the following description of several embodiments thereof, reference being had to the accompanying drawings in which:

FIGURE 1 is a diagrammatic plan view of an opened coil supporting turntable, a tight coil supporting turntable and an intermediate tension drum for establishing the necessary back tension to effect tight winding on the tight coil turntable;

FIGURE 2 is a vertical cross-sectional view through the opened coil turntable taken substantially in line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged fragmentary cross-sectional view taken substantially on line 3—3 of FIGURE 1 and illustrating the spaced apart laps of an opened coil supported on my improved coil support and retaining means;

FIGURE 4 is a plan view of an opened coil turntable illustrating a modified form of my invention; and

FIGURE 5 is an enlarged vertical cross-sectional view taken substantially on line 5—5 of FIGURE 4.

In FIGURE 1 of the drawings an opened coil C is illustrated supported on the opened coil turntable T. As seen in FIGURE 3 the laps 10 of this opened coil are spaced apart a distance somewhat greater than the thickness of the strip. It will be understood that such a coil is "loose" and has little inherent resistance to distortion in a direction normal to its axis. The outer end of opened coil C has been led around the tension drum D to the mandrel 1 of the tight coil turntable T' and a tight coil C' is being formed thereon. The turntable T, as seen in FIGURE 2, includes a main coil supporting plate or disc 2 supported for rotation about its vertical axis on shaft 3 which in turn is mounted in suitable bearings in the base structure 4. A coil centering mandrel 5 is concentrically supported for rotation with the turntable T and extends upwardly above the upper surface thereof. This mandrel may be of any suitable and well-known type and provides means for centering the opened coil on the turntable during both the coil opening operation and the tight coiling operation.

The tension drum D is mounted on a shaft 6 having a lower bearing support in a base structure 6' and an upper bearing support 7 carried by radially extending arms 8 which in turn are suitably supported from the base structure 6'.

The tight coil turntable T' is suitably supported for rotation about its vertical axis and suitable means (not shown) are provided for driving and controlling the speed of rotation of the turntable T' and the tension drum D. A reversible variable speed motor M (see FIGURE 2) has driving connection to the turntable T through the shaft 20 and suitable gearing (not shown) within the base structure 4. The controller unit 21 in the power line 22 is adapted to control the direction and rate of rotation of the motor M and thus of the turntable T.

My improved opened coil retaining supporting turntable T, as seen in FIGURES 1-3, includes a mat or pad 9 of resilient, yieldable, rubber or rubber-like material extending over substantially the entire surface of the turntable disc 2 and secured thereto as by vulcanization or bonding by any suitable means. This pad 9 has its inner periphery at the mandrel 5 and its outer periphery substantially at the outer periphery of the disc 2. It will be understood that, although rubber has been mentioned as a suitable resilient material, other rubber-like materials such as synthetic rubbers, plastics of various types, etc., may be employed, and where the term "rubber" is used in this specification and claims, it is intended to contemplate and include any resilient, yieldable, plastic type material.

When an opened coil is deposited on the turntable T, the center opening in the coil fits closely over the mandrel 5 and the lower edges of the spaced apart laps rest upon and are supported by the pad or mat 9. The rubber material of this pad or mat is made of such hardness, and the yieldability of the pad is such that, when an opened coil rests thereon, the lower edges of the spaced apart laps sink slightly into the upper face of the pad 9. This is clearly shown in FIGURE 3 where the spaced apart laps 10 of the coil C have been forced down by the weight of the strip slightly into the face of the pad 9, leaving upwardly projecting key-like portions 11 of the pad face extending into the spaces between the laps of the coil. The result of this deforming of the face of the pad 9 and keying thereof to the laps of the coil is to provide a high degree of resistance to lateral or sidewise shifting of the laps of the coil relative to the center of rotation of the turntable T.

As each of the key-like projections 11 is acted on by only a single lap of the opened coil, the total force which may tend to throw the loose opened coil out of center on the turntable is divided by the number of laps,

and thus a relatively small load is imposed upon each individual key portion 11. For this reason a material such as rubber of a durometer hardness of about 60 will maintain an opened coil on the turntable during rapid rotation thereof without lateral shifting of the spaced apart laps even though the coil may be considerably out of round or otherwise distorted when placed on the turntable.

Although I have found that rubber of a durometer hardness of about 60 is satisfactory when handling coils up to sixty inches or more in diameter of steel strip of twenty to fifty inches in width, it will be understood that for different sizes of coils and different gauges and widths of material, the durometer hardness (which is a satisfactory measure of yieldability of the pad for purposes of this use) may be varied through a considerable range, for example between 50 and 70 durometer.

In FIGURES 4 and 5 a modified opened coil supporting turntable T' is illustrated in which the metal plate or disc 12 is provided with a plurality of circumferentially spaced radially extending rubber strips or pads 13. These radial pads may conveniently be mounted on the disc 12 by providing undercut grooves 14 in the upper face 12' of disc 12 and shaping the cross-section of the pads 13 to fit. It will also be noted that the upper faces 13' of the rubber strips 13 are disposed above the upper face 12' of the turntable disc 12 so that, when an opened coil is placed over the mandrel 15, the lower edges of its spaced apart laps will rest upon each of the series of spoke-like pads 13. The weight of the coil will cause the lower edges of the laps to sink into the upper faces 13' of the pads 13 with resulting keying of the coil thereto as explained in describing FIGURE 3. With the turntable arrangement of FIGURES 4 and 5 the weight of the coil may cause the lower edges of the spaced apart laps thereof to seat upon the upper face 12' of the disc 12, but the keying action which prevents lateral shifting of the laps under the influence of centrifugal force will still be effected because the pads 13 extend above the surface of the metal disc 12.

My improved opened coil supporting turntable, whereby lateral shifting of opened coils supported thereon due to centrifugal force imposed during rotation of the turntable is prevented, has, by the keying action of the rubber pad, made possible the recoiling of opened coils into tight coil form at a much more rapid rate than is possible when the coils are supported on a smooth metal turntable.

Although I have described in considerable detail the illustrated embodiments of my invention, it will be understood that other forms of resilient yieldable pads or support members may be provided on the upper face of an opened coil supporting turntable to increase the resistance against lateral shifting of the spaced apart laps during rotation of the turntable. Accordingly I do not wish to be limited to the exact forms of my invention herein illustrated and described but claim all embodiments thereof coming within the scope of the appended claims.

I claim:

1. In apparatus for supporting opened coils of strip metal having spaced apart laps during recoiling thereof, a turntable, means for supporting said turntable for rotation about a vertical axis, controllable speed means for rotating said turntable, and resilient pad means secured to said turntable and having a normally flat depressible upper surface portion disposed to be engaged by and to support the bottom edges of the spaced apart laps of an opened coil of strip metal supported on said turntable and adapted to yield under the weight of said coil whereby lateral movement of said laps during rotation of said turntable will be prevented.

2. In apparatus for supporting opened coils of strip metal having spaced apart laps during recoiling thereof, a turntable, means for supporting and turntable for rotation about a vertical axis, controllable speed means for

rotating said turntable, and resilient pad means secured to said turntable and having a normally substantially flat upper surface disposed to be engaged by the bottom edges of the spaced apart laps of an opened coil supported on said turntable, the hardness of said pad being such that material of said pads will extend upwardly between the laps of an opened coil disposed thereon and effect a keying resistance preventing lateral movement of said laps on said turntable during rotation thereof and will return to its normally substantially flat form when the coil is removed therefrom.

3. In apparatus for supporting opened coils of strip metal having spaced apart laps during recoiling thereof, a turntable, means for supporting said turntable for rotation about a vertical axis, controllable speed means for rotating said turntable, and a resilient coil support pad of vertically yieldable material carried by said turntable and disposed to be engaged by the bottom edges of said spaced apart laps whereby material of said pad will extend upwardly between said laps and resist lateral movement of said laps on said turntable during rotation thereof.

4. In apparatus for supporting opened coils of strip metal having spaced apart laps during recoiling thereof, a turntable, means for supporting said turntable for rotation about a vertical axis, controllable speed means for rotating said turntable, a rubber coil support pad secured to the upper face of said turntable, the upper face of said pad being disposed to be engaged by the lower edges of the spaced apart laps of a coil on said turntable, and a coil centering mandrel concentric with said vertical axis of said turntable and rotatable therewith, said mandrel extending above said upper face of said pad.

5. In apparatus for supporting opened coils of strip metal having spaced apart laps during recoiling thereof, a turntable, means for supporting said turntable for rotation about a vertical axis, controllable speed means for rotating said turntable, a rubber coil support pad secured to the upper face of said turntable, the durometer hardness of said pad being between 50 and 70, and the upper face of said pad being disposed to be engaged by the lower edges of the spaced apart laps of an opened coil on said turntable.

6. In apparatus for supporting opened coils of strip metal having spaced apart laps during recoiling thereof, a turntable, means for supporting said turntable for rotation about a vertical axis, controllable speed means for rotating said turntable, and a plurality of circumferentially spaced, radially extending resilient coil retaining pads carried by said turntable and disposed to be engaged by the bottom edges of said spaced apart laps, the hardness of said pads being such that material of said pads will extend upwardly between said laps of an opened coil disposed thereon and effect a keying resistance to lateral movement of said laps on said turntable during rotation thereof.

7. In apparatus for supporting opened coils of strip metal having spaced apart laps during recoiling thereof, a turntable, means for supporting said turntable for rotation about a vertical axis, controllable speed means for rotating said turntable, and a plurality of circumferentially spaced, radially extending resilient coil retaining pads carried by said turntable, said pads having upper coil engaging faces lying in the same horizontal plane and being disposed to be engaged by the bottom edges of said spaced apart laps, the hardness of said pads being such that material of said pads will extend upwardly between said laps of an opened coil disposed thereon and effect a keying resistance to lateral movement of said laps on said turntable during rotation thereof, said upper faces of said pads being disposed above the upper face of said turntable in the absence of a coil disposed thereon.

8. In apparatus for supporting opened coils of strip metal having spaced apart laps during recoiling thereof, a turntable, means for supporting said turntable for ro-

tation about a vertical axis, controllable speed means for rotating said turntable, a plurality of circumferentially spaced, radially extending resilient coil retaining pads carried by said turntable, said pads having upper coil engaging faces lying in the same horizontal plane and being disposed to be engaged by the bottom edges of said spaced apart laps, the hardness of said pads being such that material of said pads will extend upwardly between said laps of an opened coil disposed thereon and effect a keying resistance to lateral movement of said laps on said turntable during rotation thereof, said upper faces of said pads being disposed above the upper face of said turntable in the absence of a coil disposed thereon, and a coil centering

mandrel concentric with said vertical axis of said turntable and extending above said upper faces of said pads.

References Cited in the file of this patent

UNITED STATES PATENTS

1,353,960	Houck -----	Sept. 28, 1920
2,332,576	Iversen et al. -----	Oct. 26, 1943
2,351,396	Broms -----	June 13, 1944
2,461,039	Debrie -----	Feb. 8, 1949
2,676,767	Alberts et al. -----	Apr. 27, 1954

FOREIGN PATENTS

189,380	Switzerland -----	Sept. 16, 1937
---------	-------------------	----------------