

May 7, 1940.

S. NYBERG

2,199,412

MANDREL ATTACHMENT FOR PICKLING MACHINES

Filed April 6, 1939

2 Sheets-Sheet 1

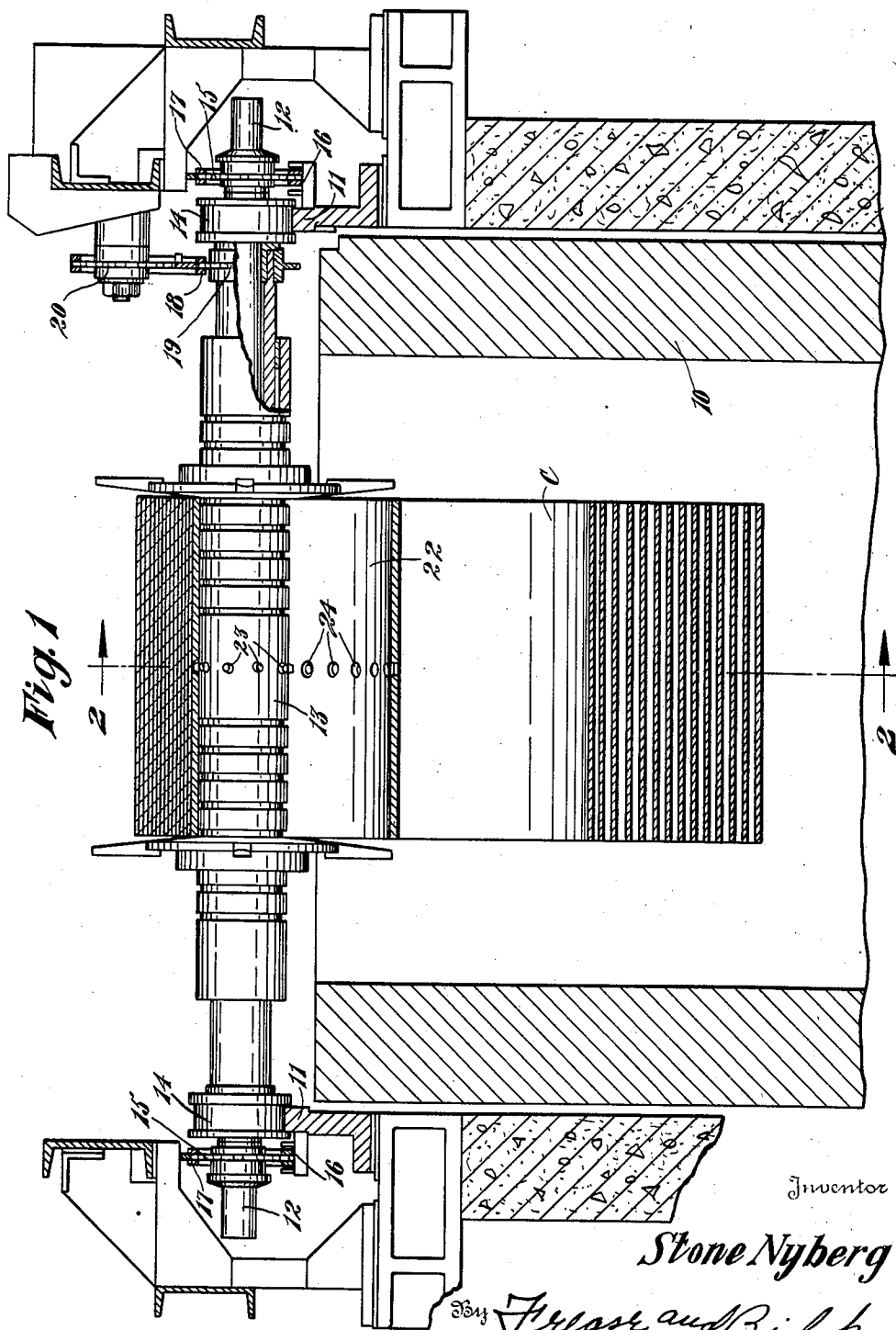


Fig. 1

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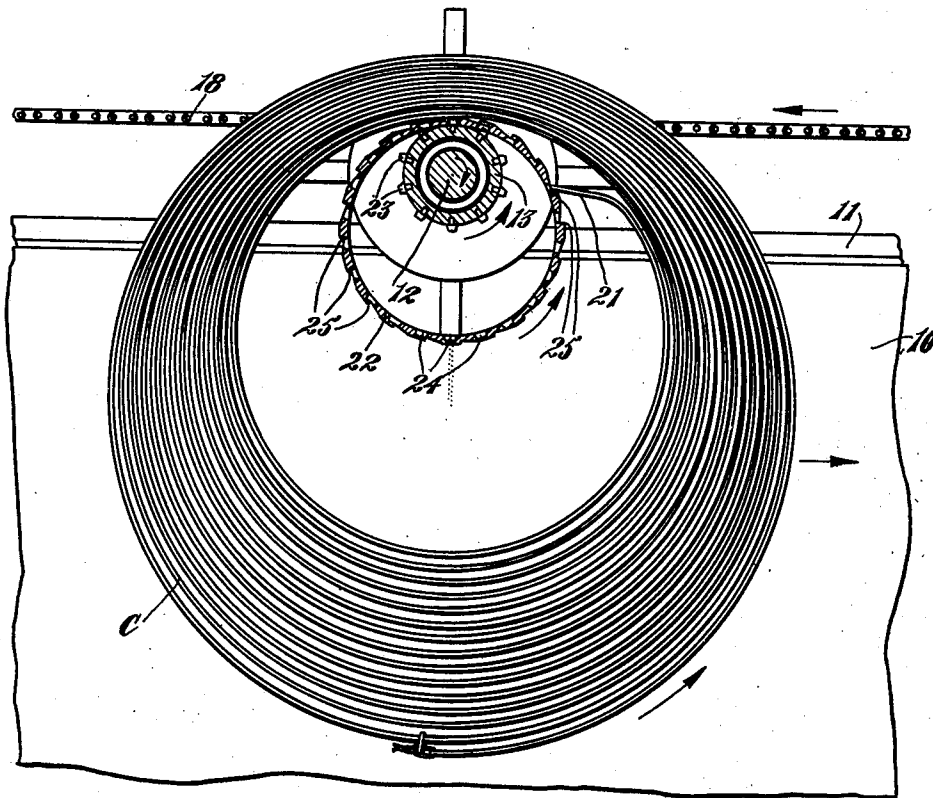


Fig. 2

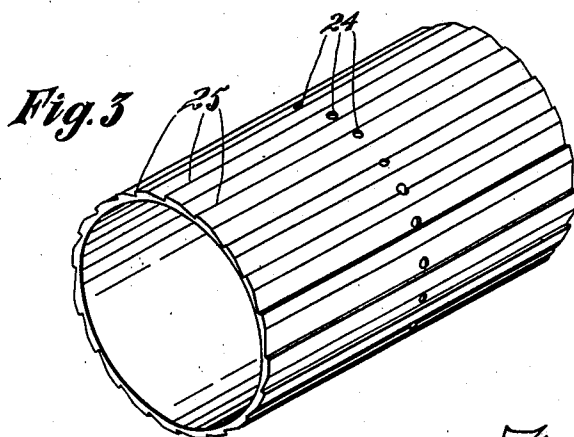


Fig. 3

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## UNITED STATES PATENT OFFICE

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## MANDREL ATTACHMENT FOR PICKLING MACHINES

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Application April 6, 1939, Serial No. 266,375

6 Claims. (Cl. 266—6)

The invention relates to pickling machines for pickling coils of metal and more particularly to a mandrel attachment for pickling machines of the general type of the Greer Patent No. 2,091,921; Shoemaker Patent No. 1,120,843; and Greer application Serial No. 249,484, filed January 5, 1939, as a continuation-in-part of Serial No. 203,507, filed April 22, 1938.

Pickling machines of the character referred to are designed for the pickling of coils of metal strip supported upon mandrels which are rotated as they are progressed through the pickling and washing tanks whereby the coils are in turn rotated by the mandrels; and in the Greer application, Serial No. 249,484, the mandrels are arranged to be rotated in reverse direction to back spin the coils during at least a portion of the time that they are being progressed forwardly so that the top of the coil moves in a direction opposite to the direction in which the coil is traveling through the machine.

Owing to the fact that the inner end of the coil is bent inward as it comes from the recoiler, difficulty has been experienced in this back spinning or reverse rotation of the tops of the coils upon the mandrels, the inturned inner end of the coil frequently contacting the side of the reverse rotating mandrel and stopping reverse rotation of the coil thereon.

The object of the present improvement is to provide a mandrel attachment in the form of a ring or tube of considerably larger diameter than the mandrel and provided with ratchet teeth having inclined forward edges and radial rear edges for engaging the inturned inner end of the coil and carrying the same over the mandrel in reverse direction.

Another object is to provide such a ring or tube with spaced apertures adapted to mesh with teeth or pins upon the mandrel so that the ring or tube will be positively driven by rotation of the mandrel in the same manner as an internal gear.

The above objects together with others which will be apparent from the drawings and following description or which may be later referred to may be attained by constructing the improved mandrel attachment in the manner illustrated in the accompanying drawings in which:

Figure 1 is a transverse sectional view through the pickling tank of a pickling machine provided with the improved mandrel attachment;

Fig. 2, a section on the line 2—2, Fig. 1; and

Fig. 3, a detached perspective view of the ratchet ring or tube forming a major part of the invention.

Similar numerals refer to similar parts throughout the several views.

The improved mandrel attachment to which the invention pertains is adapted to be used in

a pickling machine of the general type disclosed in the patents and application above referred to. Such machines comprise generally a recoiler for forming a loosely wound coil, a charging device in which a mandrel is inserted through the coil and then charged into a pickling tank, and means for rotating the mandrel and moving it forwardly to rotate the coil in the pickling acid, means being provided as shown in said Greer application, Serial No. 249,484, for reversely rotating the top of the mandrel and coil during its progress forwardly through the machine, the coil washing tanks being located in succession beyond the pickling tank with means for transferring the mandrel and coil suspended thereon from one tank to the next and for moving the mandrel and coil through the successive tanks and rotating the same therein.

A portion of the pickling tank indicated at 10, and rails 11 are shown extending longitudinally of the side walls thereof for the purpose of supporting the mandrel which may comprise a shaft 12 having a sleeve 13 rotatably mounted thereon.

The sleeve 13 extends from one roller 14 to the other, in the same manner as illustrated and described in detail in Greer application Serial No. 249,484, for Method and apparatus for pickling metal coils, filed January 5, 1939.

The mandrel shaft is provided near opposite ends with the rollers 14 which roll upon the rails 11 and with the sprocket or gear wheels 15 which ride upon and mesh with the toothed tracks 16 fixed adjacent to and parallel with the rails 11.

Drive chains 17 are provided for engaging the upper sides of the sprockets 15 for driving the mandrel forwardly through the machine.

For the purpose of rotating the mandrel sleeve in a direction opposite to the direction of the mandrel shaft a reversing machine such as disclosed in detail in the Greer application, Serial No. 249,484, may be provided. This machine includes a drive chain 18 adapted to engage the upper side of a sprocket 19 upon the mandrel sleeve 13, this drive chain being driven in the direction of the arrow thereon in Fig. 2 and passing over sprocket wheels in the reversing machine, one of which is indicated at 20 in Fig. 1.

Thus, with the mandrel shaft 12 rotating in the direction indicated in Fig. 2, the mandrel and coil C carried thereby will be moved toward the right. However, as the chain 18 of the reversing machine is moving in the opposite direction and engaging the upper side of the sprocket 19 upon the mandrel sleeve, it will be seen that the sleeve and coil will be rotated reversely or in the opposite direction to that in which the shaft is rotating.

A smooth surfaced ring or tube of considerably larger diameter than the mandrel sleeve was

placed upon the sleeve to support the coil as disclosed in the Greer application, Serial No. 249,484. However, in actual operation of the pickling machine it was found that this smooth ring loosely supported upon the mandrel sleeve did not function satisfactorily in rotating the coil in reverse direction. This was due to the fact that each coil as it comes from the recoiler has its innermost end bent inwardly at an angle as indicated at 21 in Fig. 2 of the drawings, and it frequently happened that when the mandrel sleeve was being rotated in reverse direction this inwardly bent inner end of the coil would merely contact the side of the smooth ring or tube and would not ride over the same.

In order to overcome this difficulty and to positively rotate the top of the coil in reverse direction the ring or tube 22, of considerably larger diameter than the mandrel sleeve 13 is mounted around the mandrel sleeve and geared thereto by means of the teeth or pins 23 fixed upon the central portion of the mandrel sleeve and adapted to mesh with or engage the apertures 24 formed in the ring or tube 22.

Ratchet teeth or ribs 25 having radial rear edges and inclined forward edges are formed around the periphery of the ring or tube 22 and so positioned that when the mandrel sleeve is being rotated in reverse direction relative to the mandrel shaft the inturned inner end 21 of the coil will be engaged by the radial rear edge of one of these ratchet teeth as the coil reaches the position shown in Fig. 2 and since the ratchet toothed ring is positively driven in reverse direction by means of the pin 23 and apertures 24 the coil will be positively rotated reversely so as to carry the inturned end 21 thereof over the mandrel. Each time the coil is rotated to the position shown in Fig. 2, this operation will be repeated throughout the entire reversing operation. The coil will rotate freely without interference at all other times during its reverse rotation.

When the mandrel sleeve is rotating so that the top is moving forwardly the inturned inner end 21 of the coil does not provide any interference as the same is momentarily flattened by the weight of the coil as this inner end passes over the mandrel with each rotation of the coil upon the mandrel.

From the above it will be obvious that a simple and effective device is provided for overcoming the difficulty above pointed out and for positively rotating the coil continuously in reverse direction throughout the entire reversing operation.

I claim:

1. Apparatus for treating a coil of metal, including a tank containing liquid, a mandrel, means extending longitudinally of the side walls of the tank for supporting the mandrel, a ratchet-toothed ring of considerably greater diameter than the mandrel mounted around the mandrel for supporting the coil suspended in the liquid in the tank and having teeth around its periphery, said teeth having inclined forward edges and radial rear edges, and means for rotating the mandrel so that the coil is rotated in the liquid.

2. Apparatus for treating a coil of metal, including a tank containing liquid, a mandrel, means extending longitudinally of the side walls of the tank for supporting the mandrel, a ratchet-toothed ring of considerably greater di-

ameter than the mandrel mounted around the mandrel for supporting the coil suspended in the liquid in the tank and having teeth around its periphery, said teeth having inclined forward edges and radial rear edges, a driving connection between the mandrel and the ring, and means for rotating the mandrel so that the coil is rotated in the liquid.

3. Apparatus for treating a coil of metal, including a tank containing liquid, a mandrel, means extending longitudinally of the side walls of the tank for supporting the mandrel, a ratchet-toothed ring of considerably greater diameter than the mandrel mounted around the mandrel for supporting the coil suspended in the liquid in the tank and having teeth around its periphery, said teeth having inclined forward edges and radial rear edges, there being pins upon the mandrel and apertures in the ring meshing with said pins, and means for rotating the mandrel so that the coil is rotated in the liquid.

4. Apparatus for treating a coil of metal, including a tank containing liquid, rails extending longitudinally of the side walls of the tank, a mandrel for supporting the coil, said mandrel comprising a shaft supported upon the rails, a sleeve rotatably mounted upon the shaft and a ratchet-toothed ring of sufficient length to support the coil mounted around the mandrel sleeve for supporting the coil suspended in the liquid and having teeth around its periphery, said teeth having inclined forward edges and radial rear edges, means for moving the mandrel shaft along the rails, and means for rotating the mandrel sleeve upon the shaft so that the coil is rotated and progressed through the liquid.

5. Apparatus for treating a coil of metal, including a tank containing liquid, rails extending longitudinally of the side walls of the tank, a mandrel for supporting the coil, said mandrel comprising a shaft supported upon the rails, a sleeve rotatably mounted upon the shaft and a ratchet-toothed ring of sufficient length to support the coil mounted around the mandrel sleeve for supporting the coil suspended in the liquid and having teeth around its periphery, said teeth having inclined forward edges and radial rear edges, a driving connection between the sleeve and the ring, means for moving the mandrel shaft along the rails, and means for rotating the mandrel sleeve upon the shaft so that the coil is rotated and progressed through the liquid.

6. Apparatus for treating a coil of metal, including a tank containing liquid, rails extending longitudinally of the side walls of the tank, a mandrel for supporting the coil, said mandrel comprising a shaft supported upon the rails, a sleeve rotatably mounted upon the shaft and a ratchet-toothed ring of sufficient length to support the coil mounted around the mandrel sleeve for supporting the coil suspended in the liquid and having teeth around its periphery, said teeth having inclined forward edges and radial rear edges, there being pins upon the mandrel sleeve and apertures in the ring meshing with said pins, means for moving the mandrel shaft along the rails, and means for rotating the mandrel sleeve upon the shaft so that the coil is rotated and progressed through the liquid.