Aug. 13, 1968 E. C. RINKER ET AL 3,397,134

DEVICE FOR HOLDING AND MOVING CHAINS FOR LIQUID TREATMENT THEREOF

Filed June 28, 1965 2 Sheets-Sheet 1

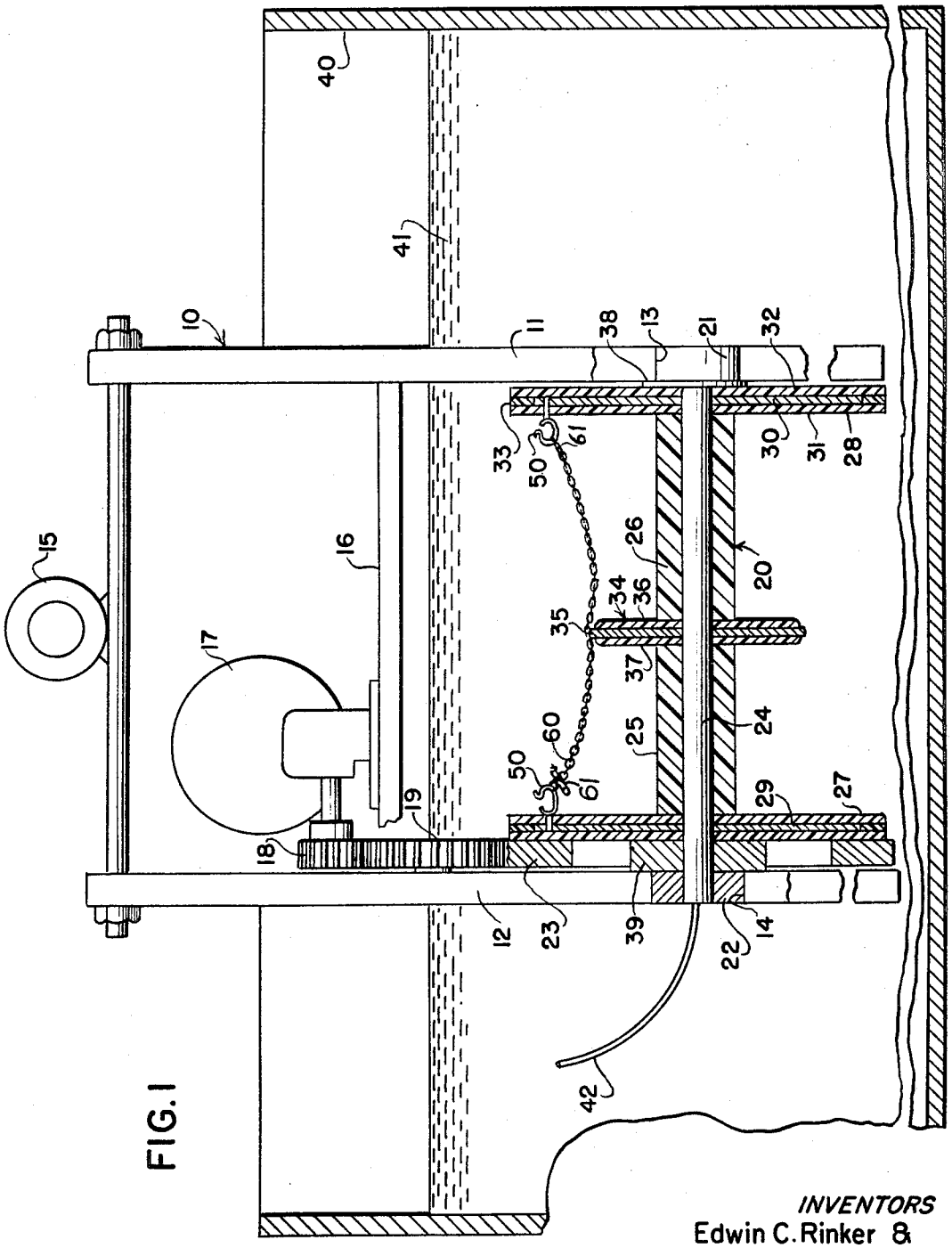



FIG. 1

INVENTORS
Edwin C. Rinker &
Fred Gilbert

by Greene and Dunn
ATTORNEYS.

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DEVICE FOR HOLDING AND MOVING CHAINS FOR LIQUID TREATMENT THEREOF

Filed June 28, 1965 2 Sheets-Sheet 2

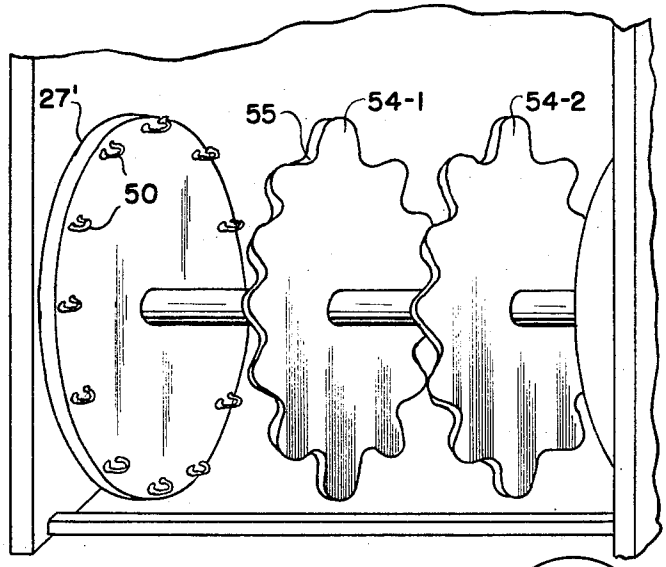



FIG.3

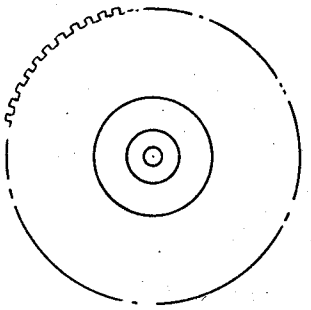


FIG.5

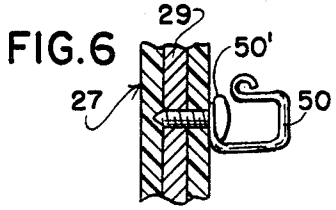



FIG.6

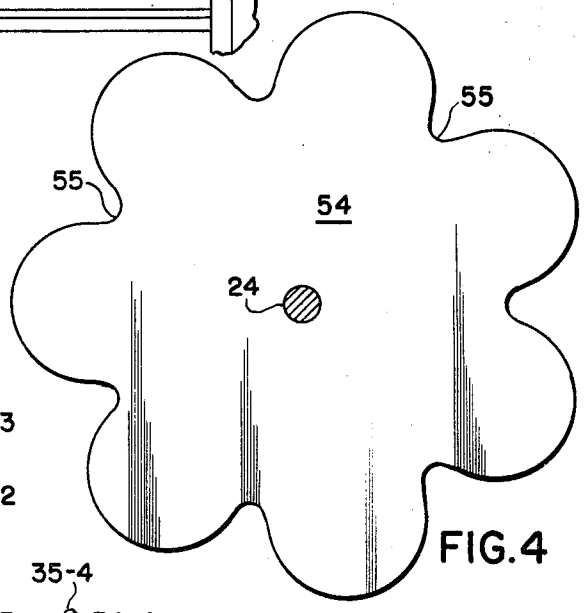



FIG.4

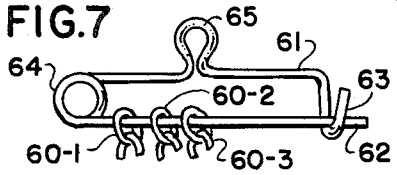



FIG.7

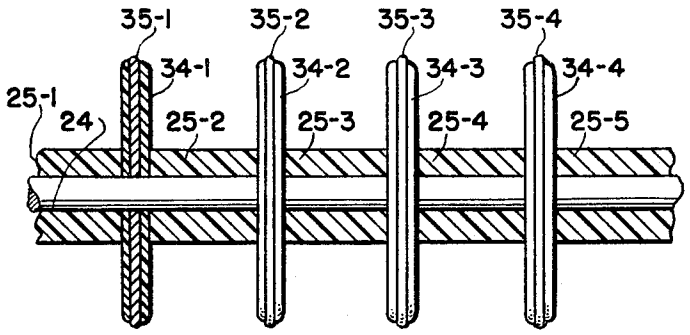



FIG.2

*INVENTORS*
Edwin C. Rinker &
Fred Gilbert

by Dressel and Sherr

ATTORNEYS.

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3,397,134

# DEVICE FOR HOLDING AND MOVING CHAINS FOR LIQUID TREATMENT THEREOF

Edwin C. Rinker, Morristown, and Frederick M. Gilbert, Ramsey, N.J., assignors to Sel-Rex Corporation, Nutley, N.J., a corporation of New Jersey

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4 Claims. (Cl. 204—212)

This invention relates to an apparatus for liquid treating chains and similar elongate metal or electrically conductive articles composed of a multiplicity of links and more particularly it relates to a device for treating chains to one or more electroplating operations.

The electroplating of delicate chains presents a problem in barrel plating, since the tumbling action tends to cluster and knot the chain into a tangled ball. This results in damaged chain, a time consuming job untangling the chain, and non-uniform or partial electroplating on the chain. The other present method is to rack each chain individually on a plating fixture. This method becomes time consuming and expensive in large production quantities. Without complex fixtures it is impossible to obtain uniform electroplated deposits with present methods. It is also nearly impossible to eliminate bare or thin spots in the electroplated coating where each link makes electrical contact with the next link with present methods.

Among the objects of the present invention is to provide an apparatus which supports chains for movement in a liquid medium in such a way as to eliminate tangling of the chains and also eliminates thin or bare spots on the plated product.

The objects of the invention are attained by providing a spool with a plurality of hook contacts at each end thereof and with at least one intermediate disk-like support and contact means for chains held on the hooks. The spool is provided with means for rotating the same with its axis in a horizontal plane while immersed in an electroplating bath. Electric current is supplied to the hook and other contacts through the axis of the spool. Preferably one or more chains to be plated are attached at their ends to a chain pin and the chain pins are attached to a pair of hooks at opposite ends of the spool so that said chains make contact with the electrodes at the ends of the spools through the chain pins and hooks and said chains make contact with the disk-like supports when travelling over the upper part of the spool. As the spool rotates the points of contact with the disk-like contact means, and the relationship of the links with respect to each other, constantly change. The rotation of the spool and chains attached thereto also provides effective agitation and renewal of electrolyte in the region of the chains.

In the drawing:

FIG. 1 is a cross-sectional view of the device fitted into a frame for rotating the same and immersed in an electroplating bath.

FIG. 2 is a detail view partly in cross-section, of a modified form of the invention.

FIG. 3 is a perspective view of another modified form of the invention.

FIG. 4 is a detail plan view of a contact element of FIG. 3.

FIG. 5 is an end view of the spool itself from the gear-containing end.

FIG. 6 is a detail view showing how hooks are attached to the ends of the spool.

FIG. 7 is a detail view of a chain pin.

The spool, chain-holding device **20** of the invention is shown as a device which can be fitted into the frame **10** for holding and rotating a plating barrel. Thus, frame **10** comprises two side supports **11** and **12** containing holes



**13** and **14** adapted to receive the plastic bearings **21** and **22** of the spool. The frame may have an eyelet **15** for lifting the same and includes a support means **16** for a motor **17** which rotates one or more gears **18** and **19** one of which is adapted to mesh with the gear **23** of the spool **20**. The whole frame is adapted to be immersed in a bath **40** containing electroplating liquid or other liquids associated with the electroplating processes.

Extending substantially all the way through the axis of the spool **20** is the conductor element **24** which may be connected to a suitable source of electrical energy through conductor **42** shown only diagrammatically. Conductor **24** is covered over most of its lengths by electrically insulating plastic tubes **25** and **26**. Although solid plastic tubes are shown, the conductor can be covered by any suitable insulation as a layer of plastic coating composition or an insulating tape, for example. The spool rims **27** and **28** comprise an internal conducting means **29** and **30** suitably covered with insulating material. Thus, rim **28** comprises the conducting disk **30** surrounded on its two sides by plastic disks **31** and **32** and closed at the end by a ring **33**. The ring **33** forms a filler material by which rings **31** and **32** are cemented together. Rim **27** is formed similarly to rim **28**. Although conducting means **29** and **30** are shown as disks, they may take the forms of spiders with spokes extending from a hub-like center portion. Although the plastic disks **31**, **32** and ring **33** make a very attractive cover for a contact disk **30**, it is obvious that the disk **30** may be provided with other non-conducting coatings. A satisfactory coating may be formed, for example, by dipping the disk in a plastic coating compound or by a fluidized bed coating process. In fact, the metal parts can be assembled and coated as a unit with plastic by dipping or by the fluidized bed process. The disks **29** and **30** preferably have openings formed therein prior to applying the non-conducting layers thereto. Hook elements **50** of a type having spring-like bases are conductively secured to the inner conducting disk or spider **29** or **30** on the inside of the rim **27** or **28** by suitable means such as screws **50'** (see FIG. 6). Where disks **29** and **30** are coated by a fluidized bed or dipping process, the hooks **50** may be secured to the disks **29** and **30** prior to coating.

The central, chain-supporting disk **34** comprises a central conducting disk **35** which makes electrical contact with conductor **24** and which is flanked on its two sides by non-conducting disks **36** and **37** of smaller diameter than disk **35** so that the periphery of disk **35** is exposed for contact with an intermediate portion of a chain **60** being plated. Spacer elements **38** and **39** are provided between bearings **21** and **22** and the rims **28** and **27**, respectively.

The tubes **25**, **26**, rims **27**, **28**, spacer elements **38**, **39** and bearings **21** and **22** are preferably cemented together at their contacting surfaces. The gear ring **23** is also cemented to the rim **27**.

To facilitate loading the spool **20**, one or more chains **60–1**, **60–2**, **60–3**, etc., are attached at their ends to the chain pins **61** show in detail in FIG. 7. Chain pin **61** has a prong **62** held by hook keeper **63** and also has loops **64** and **65** either of which may be threaded on hook **50**. Chain pins **61** can be omitted where only one chain per pair of hooks **50** is required.

As illustrated in FIG. 2, a plurality of intermediate contact disks **35–1** to **35–4** may be employed especially where longer chains are to be plated.

FIG. 3 shows a chain-plating spool with two chain-contacting disks **54–1** and **54–2** having crenulated peripheries. Preferably, the number of crenulations **55** in the disks **54–1** and **54–2** correspond to the number of hooks **50** on the spool rims **27'**. The crenulations **55** as shown in detail in FIG. 4 are deep enough to tend to

retain the chains attached to a particular pair of chain pins within those crenulations which correspond to or are more or less in alignment with the hooks **50** on the rims of the spool.

In practice, chains to be plated are attached at their ends to a pair of chain pins **61** and the chain pins are attached to a corresponding pair of hooks **50** on the rims **27**, **28** of the spool, the chain suspension being loose enough to make contact with the central disk **35** (or disks) when the spool is in a position with its axis horizontal and the chain is in position on the upper part of the spool. The spool when loaded with chains to be plated is positioned in a suitable spool-holding and rotating means such as the frame **10** of FIG. 1, and may be transported through a complete electroplating system such as used in barrel plating and which may include cleaning, rinsing, flash plating, electroplating, rinsing, etc.

The features and principles underlying the invention described above in connection with specific exemplifications will suggest to those skilled in the art many other modifications thereof. It is accordingly desired that the appended claims shall not be limited to any specific feature or details thereof.

We claim:

**1.** In a device for subjecting chains to liquid treatment such as electroplating operations, an improved chain-holding and moving device comprising,

a spool comprising a core with two end rims and at least one centrally positioned disk extending peripherally from the core,

conductor means extending through the core between the rims thereof,

each of said rims comprising a conductor element with a central portion making electrical contact with said conductor means and with portions extending radially from the central portion to approximately the edge thereof,

the conductor elements of said rims and said core being substantially completely covered with electrically nonconducting material,



a plurality of electrically conducting hook means extending from the conductor elements of a first of said rims toward the second rim,

a similar number of electrically conducting hook means on said second rim whereby a chain may be suspended between said rims by attaching the end regions thereof to a pair of said hooks on opposite rims,

said centrally positioned disk comprising a conductor element extending from the conducting means on said core to the periphery of the disk,

portions of the said centrally positioned disk between the core conducting means and adjacent to but short of the periphery being covered by electrically nonconducting material.

**2.** The device as claimed in claim **1** comprising at least two centrally positioned disks with conducting peripheries.

**3.** The device as claimed in claim **1** wherein said centrally positioned disk has a crenulated periphery, the crenulators thereof corresponding in number to the number of hook means on one of said rims.

**4.** The device as claimed in claim **1** comprising in combination a plurality of pairs of chain pins, each adapted to retain a number of chain ends, for connecting a plurality of chains to each pair of hooks on opposite ends of the spool.


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JOHN H. MACK, *Primary Examiner.*

W. VAN SISE, *Assistant Examiner.*