United States Patent

[11] **3,549,077**

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[21] Appl. No. **786,191**
[22] Filed **Dec. 23, 1968**
[45] Patented **Dec. 22, 1970**

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Division of Ser. No. 524,018, Feb. 1, 1966, Patent No. 3,432,914.
assignment
Original application Feb. 1, 1966, Ser. No. 524,018, now Patent No. 3,432,914.
Divided and this application Dec. 23, 1968, Ser. No. 786,191

[54] **APPARATUS FOR FABRICATING THIN-WALLED STEEL CYLINDERS**
6 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **228/15,** 29/477.3, 29/605; 93/80; 138/54; 219/62; 228/5, 228/17

[51] **Int. Cl.** **B23k 1/20**
[50] **Field of Search** 228/5, 15, 17; 219/62; 93/80; 29/477.3, 605; 138/54

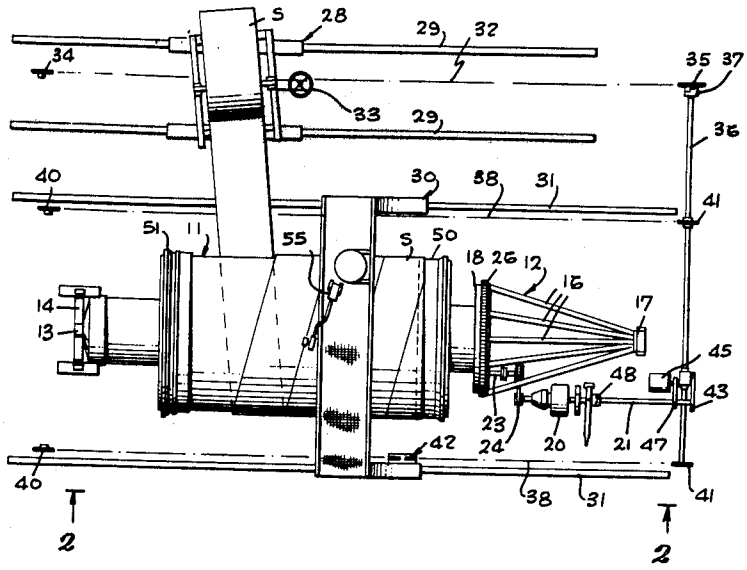
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Primary Examiner—John F. Campbell
Assistant Examiner—Robert J. Craig
Attorney—William R. Graham

ABSTRACT: A collapsible rotatable drum on which steel strip is wound helically from a traveling carriage for the supply of strip together with a gantry carrying welding means to join the edges of the strip into a cylinder, and motorized means for coordinating movement of the carriage and gantry with rotation of the drum.



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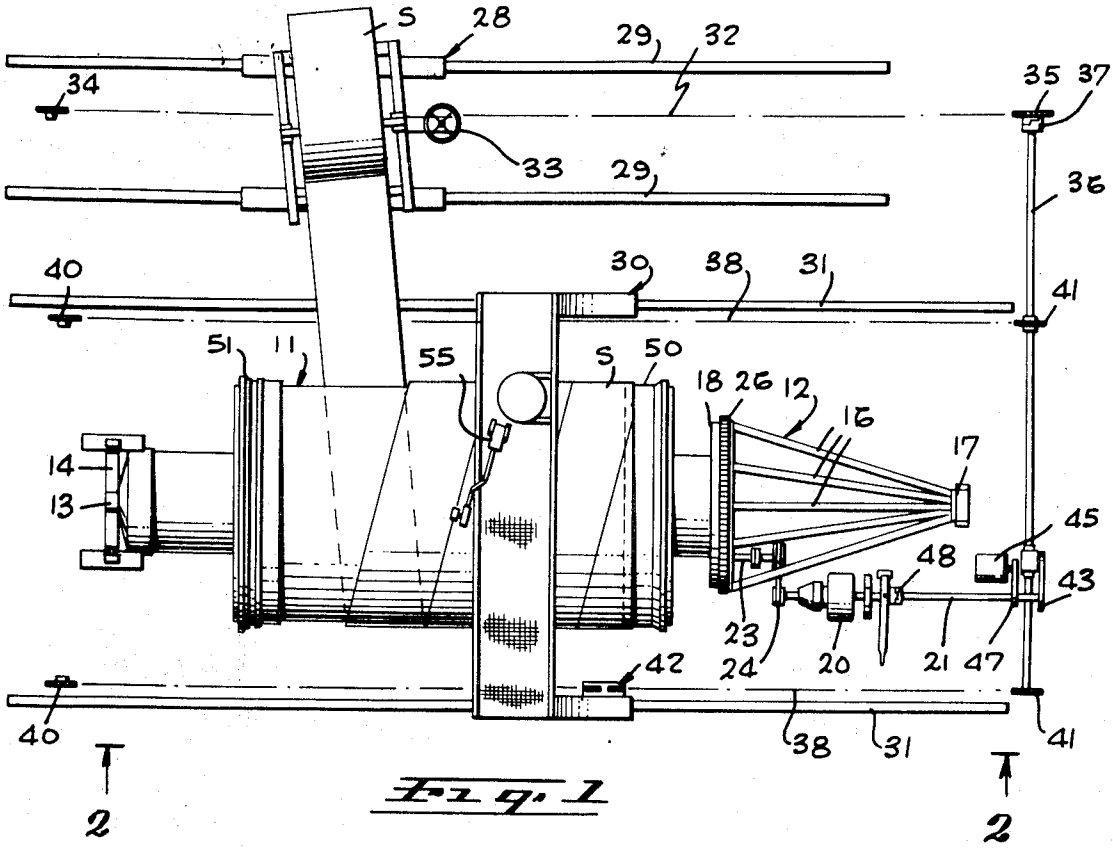


Fig. 1

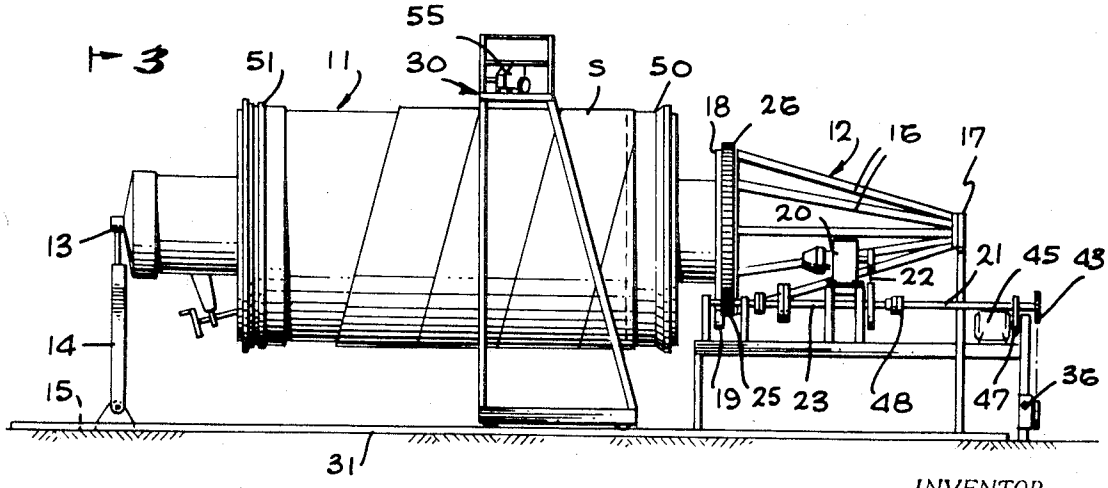


Fig. 2

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Fig. 3

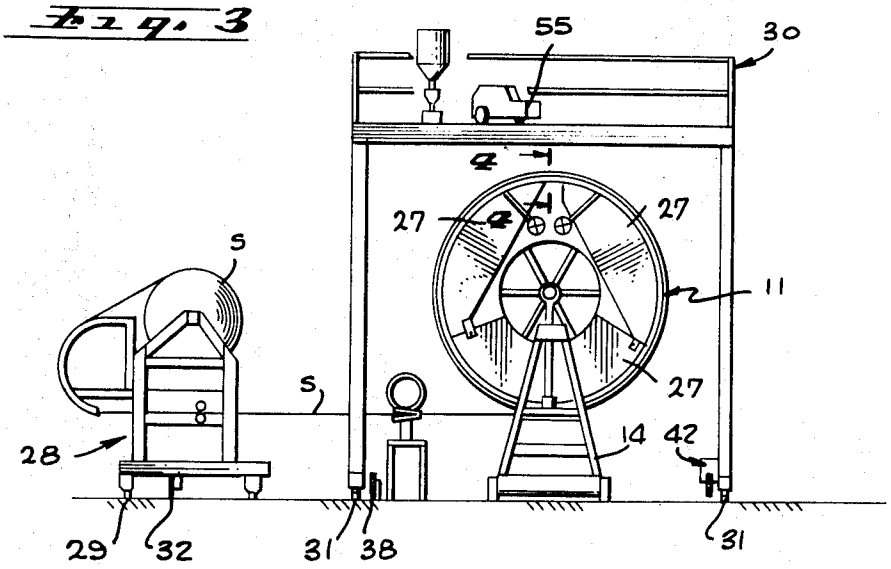


Fig. 6

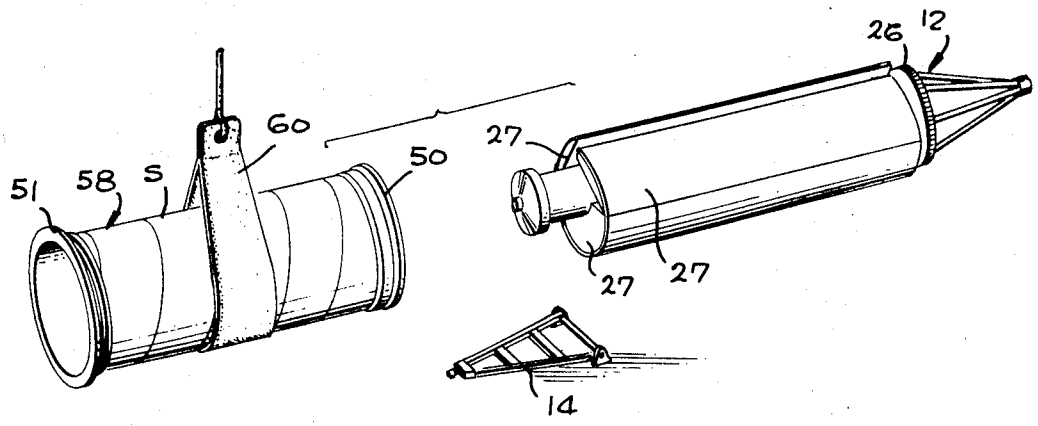


Fig. 4

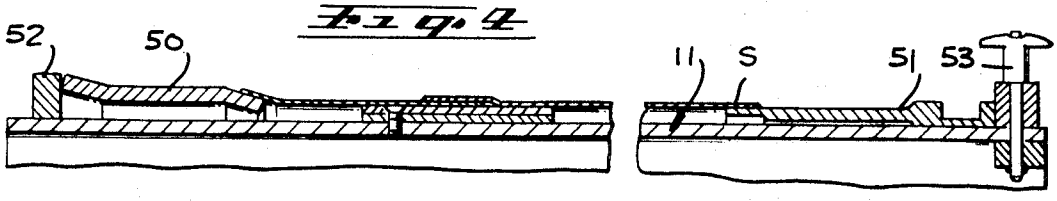
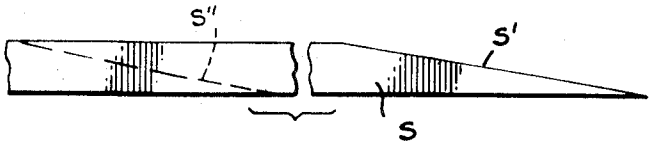


Fig. 5



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APPARATUS FOR FABRICATING THIN-WALLED STEEL CYLINDERS

This is a division of application Ser. No. 524,018, filed Feb. 1, 1966, now U.S. Pat. No. 3,432,914.

This invention has to do generally with the art of fabricating metal cylinders, and particularly with fabricating relatively thin-walled pipe cylinders used as a continuous cylindrical reinforcement member in large diameter concrete pipe.

In certain types of large diameter concrete pipe, a relatively thin-walled steel cylinder is embedded in the pipe wall by casting the pipe around the cylinder in the mold, and such cylinders are provided at one end with a bell-type joint ring or band and at the other end with a spigot-type joint ring or band. It is customary to fabricate such reinforcement cylinders from steel sheets which have been flattened and sheared to size. These sheets are rolled into cylindrical form and a longitudinal seam formed by welding. It is then necessary to install the joint bands on the ends of the cylinder and, because of the large diameter of the cylinder, which may be served several feet, and the thinness of the metal wall, the cylinder is not self-supporting when disposed horizontal, tending to collapse and making it difficult to handle. Consequently, each such cylinder requires a special jig to support it, and special expanding presses and considerable labor are entailed to mount the joint rings on the ends of the cylinder. Furthermore, great difficulty is experienced in matching the cylinder to the joint rings and in so mounting the rings that they will be in axial alignment.

An object of the present invention is to provide novel means to enable use of a method of fabricating pipe cylinders of the type described, utilizing less expensive steel and requiring less time and labor than conventional methods.

A further object is to provide novel apparatus whereby the fabrication of the cylinder can be readily carried out and which assures axial alignment of the joint bands at the ends of the cylinder.

Another object is to provide novel apparatus for fabricating steel cylinders in which end rings or joint bands are firmly held in axial alignment and the sheet metal cylinder is formed therebetween by novel means which helically winds a length of strip steel between the bands.

By way of summary, it is an object of the invention to provide apparatus including a rotary drum, and both a carriage and gantry movable axially of the drum in which novel means is provided for rotating the drum and for moving the carriage and gantry in timed relation therewith and further for allowing selective driven movement of the carriage and gantry independent of the rotation of the drum.

These and other objects will be apparent from the drawings and the following description. Referring to the drawings, which are largely diagrammatic in character:

FIG. 1 is a plan view of apparatus embodying the invention;

FIG. 2 is a side elevational view of the apparatus of FIG. 1, on line 2–2 of FIG. 1;

FIG. 3 is an end elevational view, on line 3–3 of FIG. 2;

FIG. 4 is a longitudinal fragmentary sectional view through the wall of a completed cylinder on the drum upon which it is formed, on line 4–4 of FIG. 3;

FIG. 5 is a fragmentary plan view showing the way in which the steel strip is severed in the process; and

FIG. 6 is a fragmentary isometric view showing the product being removed from the supporting drum on which it was fabricated.

More particularly describing the invention, all the views of the drawings are diagrammatic in character since details of construction are unimportant. Reference numeral **11** generally designates a rotatably drum upon which the pipe cylinder is fabricated. This drum is supported by the structure **12** as a cantilever beam. However a bearing **13** is provided at the other end of the drum, and this is normally supported upon a removable or demountable post **14** which is shown as pivotally mounted at its base on a suitable foundation **15**. The structure **12** includes a conical openwork frame **16** rotatably supported at its outer end on a bearing **17** and having rim **18** supported on rollers **19**. An electric motor **20** with suitable gear reduction means is shown connected to a shaft **21** through a chain drive **22**. Shaft **21** drives a jackshaft **23** through a chain drive **24**. Shaft **23** carries a pinion **25** which meshes with and drives a gear **26** on the structure **12**.

The drum is preferably formed of three or more segments **27** mounted in such a manner that the drum may be partially collapsed radially inward, however, since drums of this type are well known, the details of such construction are not shown.

In conjunction with the drum, I provide a carriage **28** movable along a track **29** which extends generally axially of the drum, the track being parallel to and laterally spaced from the rotary axis (also the longitudinal axis) of the drum. This carriage is adapted to support a supply roll of steel strip designated S.

I also provide a welding equipment support, designated **30**, which is shown as a gantry structure traveling on rails **31** extending generally axially of the drum. The rails extend parallel to the rotary axis of the drum, being located on each side of the drum so that the gantry straddles the drum.

The motor **20** is also used for moving the carriage **28** and the gantry **30** longitudinally of the drum in timed relation with the rotation thereof, and by way of illustration I show a chain drive for each of these. Thus an endless chain **32** passes through a phase adjustable chain grip means **33** of any suitable type on the carriage (adapted normally to grip the chain but operable to advance or retard the carriage relative to the chain for the purpose of making adjustments) and is trained around sprockets **34** and **35**, the latter being connectable to a shaft **36** by a clutch **37**. Two chains **38** in spaced parallel relation are supported on sprockets **40** and **41** and a releasable chain grip means **42** is provided on gantry **30** for each chain. The two sprockets **41** are fixed on shaft **36**. The latter is driven through a suitable gear and drive train means **43** which is powered by the main motor **20** and, when desired, by an auxiliary motor **45**. The auxiliary motor is connected to shaft **21** by a belt drive means **47**. A clutch **48** is included in shaft **21** between the two motors.

With the arrangement described, the shaft **36** can be driven independently of the main motor when clutch **48** is disengaged for the purpose of moving the gantry **30** and the carriage **28** independently of the rotation of the drum. However, it will be apparent that when the clutch **48** is engaged and the motor **20** is rotating the drum, shaft **36** will be turned in timed relation with the rotation of the drum and consequently both the carriage **28** and gantry **30** can therefore be caused to travel axially of the drum in timed relation to the speed of rotation of the drum. If desired, the gantry **30** can be released from the drive chains and thus remain stationary to provide a stationary platform for welding and thus enable a welding means **55** to be used for making a circumferential girth weld.

In using the apparatus I first mount the two end or joint rings **50** on drum **11** by partially collapsing the drum and placing the rings thereon in proper spaced relation and then returning the drum to its expanded cylindrical form to hold the joint rings in place. In some cases it may be desirable to clamp the joint rings to the drum. Lugs **52** and abutment pins **53** are provided at the inner and outer ends of the drum, respectively.

With the joint rings in place I then weld the end of a length of the steel strip S to one of the end rings, preferably the one designated **50**, and for this purpose the end of the strip is first sheared at an angle to provide an end edge S' (FIG. 5) so that it will form a squared end when the strip is wound helically about the drum. The strip is then wound upon the drum from ring **50** to ring **51** and this is accomplished by rotating the drum as previously described and at the same time causing the carriage **28** to travel along the track axially of the drum in timed relation thereto. The carriage is so oriented with respect to the drum and the end rings thereon that the strip will be wound at the desired helix angle. Also, any suitable means

may be used on the carriage for resisting the pulling of the strip as it is wound.

While the strip is being wound on the drum, or later, if desired, a spiral seam is formed at the adjacent edges of the turns by welding these together with suitable welding means **55** carried on the gantry. The latter is advanced by the means previously described in timed relation with the rotation of the drum, except that the gantry may be disengaged from the drive chains to enable the welding of a girth seam at each end, or for any other purpose.

When the wrapping of the steel strip has progressed to ring **51**, the strip is then tack-welded to such end ring and sheared at an angle, as along the broken line S'' in FIG. **5**, so that the end of the cylinder as wound will also be square or normal to the axis. At this point it may be noted that in shearing the strip to form the end thereof, the same shearing operation forms the beginning end of the strip for the next winding operation. Any suitable type of joint may be formed during the welding of the seam and when the welding has been completed the post **14** is lowered and the completed pipe cylinder **58** removed from the drum, the drum being collapsed for the purpose and the cylinder being moved by means of a suitable sling **60** placed therearound and a conventional hoist or the like (not shown).

I claim:

1. In apparatus for fabricating relatively large diameter steel cylinders of relatively thin strip stock with a joint band at each end, a cylindrical drum, motorized means at one end of the drum for supporting the drum as a cantilever and for rotating the drum, a carriage movable along a path parallel to the rotary axis of the drum, means for moving said carriage in timed relation to the rotation of said drum, means mounted on said carriage for carrying a supply of steel strip and allowing the strip to pay out and be wound about the drum, a wheeled welding equipment support mounted for movement along a path extending axially of the drum, and means for moving said support in timed relation to the rotation of said drum.

2. The apparatus set forth in claim **1** in which said drum is

provided with a bearing at its free end, and in which a removable support is provided between a foundation and said bearing.

3. In apparatus for fabricating steel cylinders of relatively thin strip stock, a drum mounted for rotation, a motor, a drive connection between said motor and said drum for rotating the drum, a carriage mounted for movement along a path to one side of the drum and extending parallel to the rotary axis thereof and adapted to carry a roll of steel strip to be wound about the drum in a helical pattern, means for moving the carriage in timed relation with rotation of the drum including a drive train connected to the drive connection between the motor and the drum, and auxiliary motorized means for moving said carriage independently of rotation of the drum.

4. The apparatus set forth in claim **3** in which a gantrylike welding means support is mounted to straddle said drum and for movement axially thereof, and in which means is provided for moving said support in timed relation to rotation of the drum, and in which further means is provided for moving said support independently of rotation of said drum.

5. In apparatus for fabricating steel cylinders of relatively thin strip stock, a drum, means supporting the drum for rotation, a motor, a drive connection between said motor and said drum for rotating the drum, a carriage mounted for movement along a path to one side of the drum and extending parallel to the rotary axis thereof and adapted to carry a roll of steel strip to be wound about the drum in a helical pattern, means for moving the carriage in timed relation with rotation of the drum including a drive shaft extending normal to the rotary axis of the drum, a drive connection including a clutch between said shaft and said motor, and drive chain means connected to said carriage and driven by said shaft, and an auxiliary motor operably connected to said shaft between said clutch and said shaft.

6. The apparatus set forth in claim **5** in which a gantrylike welding means support is mounted to straddle said drum and for movement axially thereof, and in which a drive chain means is connected to said support and is driven by said shaft.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,549,077 Dated December 22, 1970

Inventor(s) George E. Huck

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 20, delete "served"; line 69, "rotatably" should be --rotatable--.

Column 2, line 57, after "rings 50" insert --and 51--.

Signed and sealed this 28th day of September 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Pate