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[54] **METHOD AND APPARATUS FOR UNWINDING COILED MATERIAL**

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[52] **U.S. Cl.** ..... **242/128**, 242/54 R

[51] **Int. Cl.** **B65h 49/00**

[58] **Field of Search** ..... 242/45, 54 R, 75.5, 75.51, 242/128, 129; 219/157, 130

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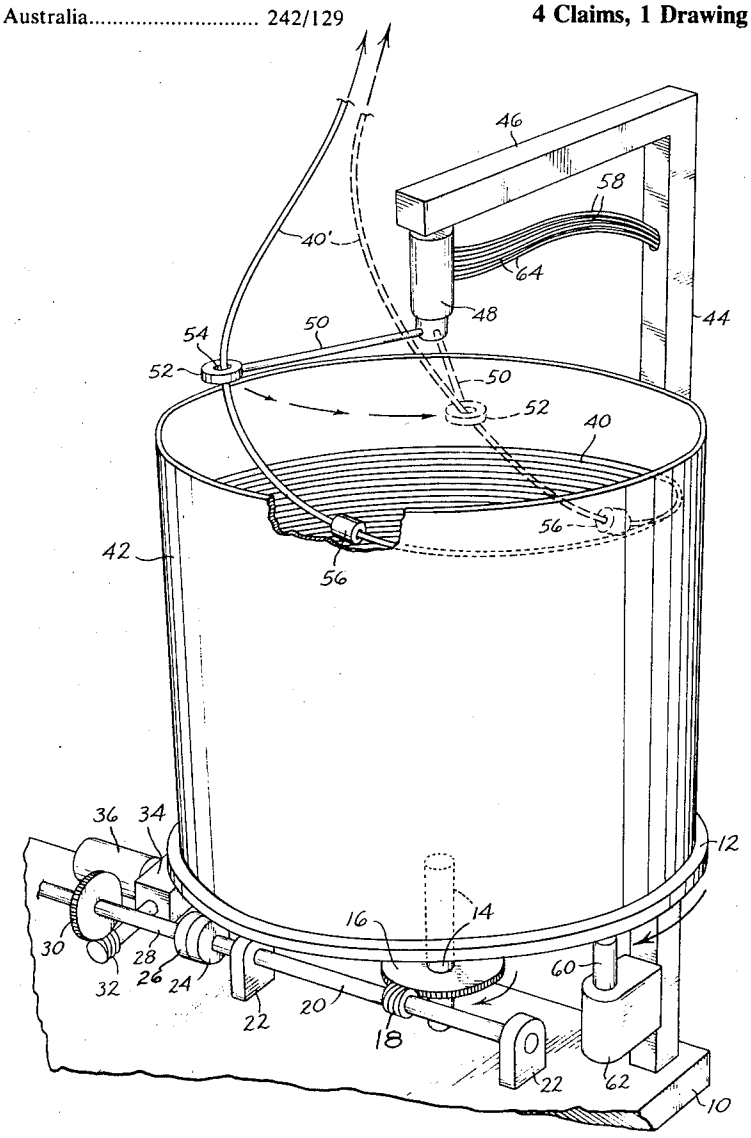
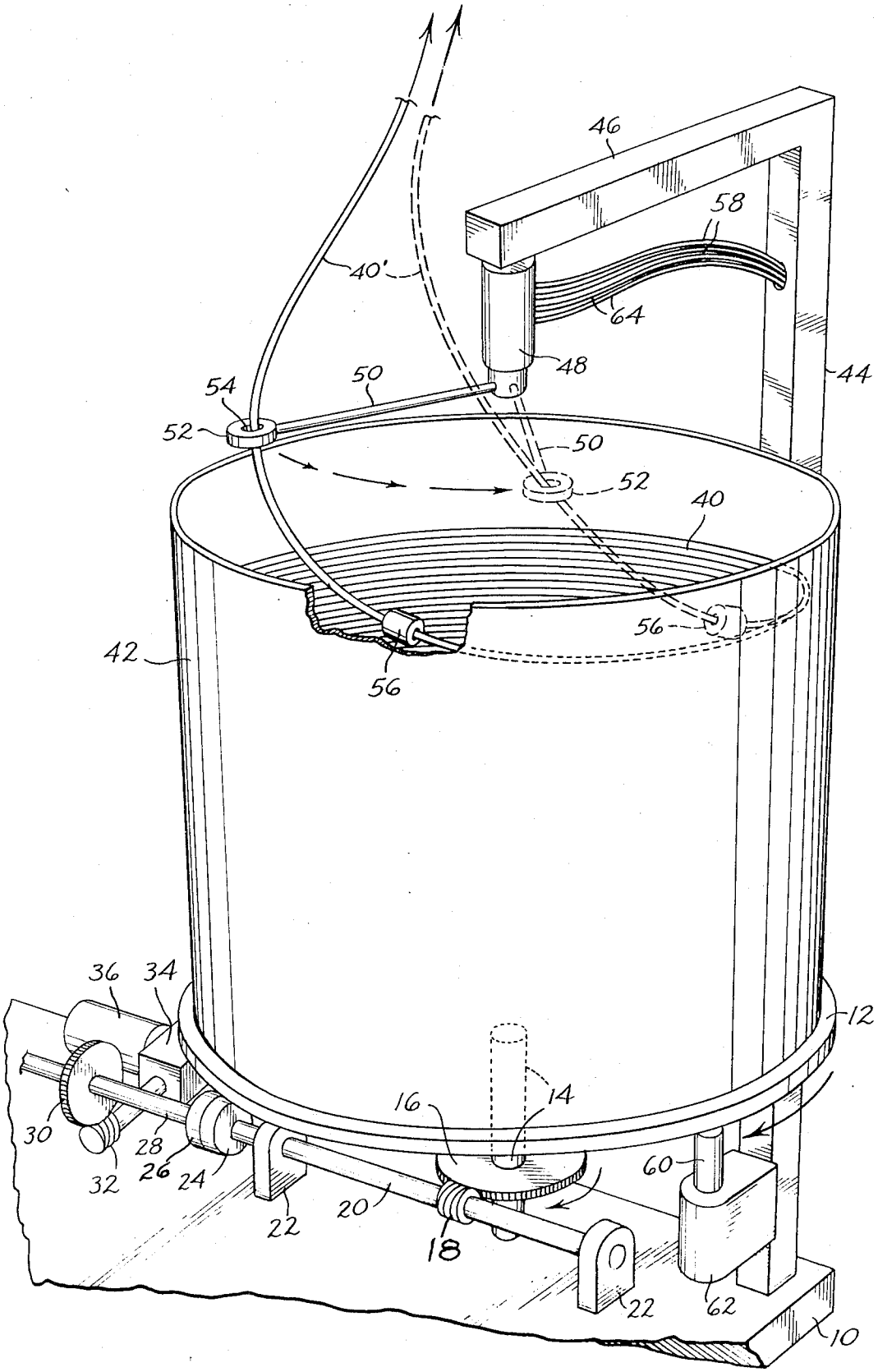
[57] **ABSTRACT**

A rotatable platform is arranged to support a coil of material from which the material is to be fed in a direction substantially parallel to the axis of the coil. The outfeed end of the coil of material is received freely upward through a guide opening in the arcuately reciprocative arm of a control switch mounted above the platform. In a first position of the arm the switch is operated to effect rotation of the platform through an arc in the direction of the winding of the coil of material, whereby the outfeed end of the latter moves the arm to a second position in which the control switch is operated to effect stopping of rotation of the platform and to energize a platform brake. As the material continues to be fed from the coil it causes the arm to return to the first position, once again to effect rotation of the platform. Ths stepwise rotation of the platform during upward outfeeding and consequent unwinding of the coil of material prevents twisting and kinking of the outfeeding material.

4 Claims, 1 Drawing Figure

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METHOD AND APPARATUS FOR UNWINDING COILED MATERIAL

BACKGROUND OF THE INVENTION

This invention relates to the unwinding of coiled material, and more particularly to a method and apparatus for unwinding coiled material in a direction substantially parallel to the axis of the coil, without twisting and kinking of the outfeeding material.

There are many commercial and industrial applications in which it is required to unwind coiled material. One such application is the unwinding of welding wire from a coil to feed automatic welding apparatus. For this purpose it has been the practice heretofore to utilize coils of welding wire of relatively small dimension and weight, since they are convenient to handle and to mount for axial rotation so as to pay out the wire in a direction tangential to the circumference of the coil, i.e., perpendicular to the axis of rotation of the coil. The outfeeding of coiled material in this manner prevents twisting and kinking thereof.

The aforementioned use of small and relatively light weight coils of welding wire has two primary disadvantages. First, the coils are consumed rapidly and thus require frequent replacement, with correspondingly frequent production shutdowns. Second, they are relatively expensive as compared with substantially larger coils which also are available commercially.

On the other hand, the use of larger coils of welding wire has been avoided heretofore because of the inability to prevent twisting and kinking of the wire as it is fed from the coil. In this regard, it is because of the excessive size and weight of such a coil that it is more convenient in many applications to pay out the wire in a direction substantially parallel to the axis of the coil. Thus, unless the outfeeding end of the wire is rotated in a direction opposite the winding of the coil, it becomes twisted and kinked. However, automatic welding apparatus does not provide for such rotation of the wire, but rather the wire is gripped quite firmly as it is fed through and consumed in the welding apparatus. Moreover, any rotation of the wire at the point where the welding operation takes place, tends to move the wire away from the point of application, thereby resulting in inferior and oftentimes unacceptable welding.

As an alternative to the requirement of rotating the wire as it is fed from a large coil in a direction substantially parallel to the axis of the coil, the coil itself may be rotated in the direction of the coil winding, whereby to eliminate twisting and kinking of the wire. However, such rotation of the coil must necessarily be synchronized precisely with the rate of consumption of the welding wire. Since the rate of consumption is intermittent and variable for various types of welding operations, it is economically unfeasible to provide satisfactory synchronization of coil rotation and wire consumption.

SUMMARY OF THE INVENTION

In its basic concept the method and apparatus of this invention involves the rotation of a coil of material in the direction of the coil winding stepwise as the material is fed from it in a direction substantially parallel to the rotational axis of the coil, preferably utilizing the outfeeding material to control the stepwise rotation of the coil.

It is by virtue of the foregoing basic concept that the principal objective of this invention is achieved; namely, to overcome the aforementioned disadvantages of prior coil unwinding methods and apparatus.

Another important object of this invention is the provision of apparatus of the class described which may accommodate the controlled rotation of a plurality of coils of material from a single drive source.

A further important object of this invention is the provision of apparatus of the class described which is of simplified construction for economical manufacture.

The foregoing and other objects and advantages of this invention will appear from the following detailed description, taken in connection with the accompanying drawing of a preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWING

The single FIGURE of the drawing is a fragmentary perspective view of coil unwinding apparatus embodying the features of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the drawing the illustrated apparatus includes a base **10** upon which the remaining components are supported. The base may be formed in any manner desired, such as by the platform illustrated, an assembly of structural frame members, etc., and it may be rendered portable by mounting on wheels.

A rotatable platform **12** is mounted on the base by means of a shaft **14** extending upwardly from the base. A gear **16** secured to the shaft meshes with a worm **18** secured to an elongated driven shaft **20** supported for rotation by longitudinally spaced bearings **22** mounted on the base.

The shaft may be driven directly from a source of rotary power. However, in the preferred embodiment illustrated one end of the shaft is connected to one component **24** of a clutch. The other clutch component **26** is connected to a shaft **28** to which is secured a gear **30** meshing with a worm **32** secured to the output shaft of a gear reduction unit **34.** The input of the gear reduction unit is connected to the output of a drive motor **36.**

Thus, the drive motor may be operated continuously to effect continuous rotation of the shaft **28.** Selective rotation of the associated shaft **20** then may be controlled by appropriate operation of the clutch which functions to releasably interengage the shafts **20** and **28.**

The use of a clutch to releasably interconnect the shafts **20** and **28** accommodate the use of the continuously operated motor **36** to drive a plurality of rotatable platforms **12** selectively and independently of each other. Thus, the end of the shaft **28** opposite the clutch component **26** may support a similar clutch component for cooperative association with an arrangement of components similar to the clutch component **24,** shaft **20,** worm **18,** gear **16,** shaft **14** and platform **12.**

The platform **12** is arranged to support thereon a large coil of material to be unwound. In the embodiment illustrated in the drawing a large coil of welding wire **40** is shown confined in a drum **42,** the upper end of which is opened to expose the coil. The drum has been placed upon the platform, as by means of a lift

truck, or other equipment capable of lifting the heavy drum and depositing it upon the platform. The axis of the coil is disposed substantially parallel to, and preferably coaxial with, the rotation axis of the platform.

Means is provided for controlling selectively the intermittent, stepwise rotation of the platform **12** in the direction of the winding of the coil **40,** as illustrated by the arrow in the drawing. Such means may be manually operated means for releasably interengaging the clutch components **24** and **26.** However, in the preferred embodiment illustrated, the control means is operated by the outfeeding portion **40'** of the welding wire being unwound from the coil.

Accordingly, an elongated hollow post **44** is mounted at its lower end on the base **10** and extends upwardly therefrom adjacent the platform **12** and terminates at its upper end above the drum. A beam **46** is secured to the upper end of the post and extends horizontally therefrom over the platform a spaced distance above the drum. The outer end of the arm supports a control switch **48** provided with an actuating arm **50** which is movable arcuately between two positions of adjustment described more fully hereinafter.

Means is provided at the outer end of the arm **50** for freely receiving and guiding the outfeeding portion **40'** of the wire as the latter is unwound from the coil. In the embodiment illustrated, such means is in the form of an annular ring **52,** providing a guide opening **54** through which the wire is freely received. If desired, the annular ring may be split, forming a pair of spaced fingers defining the guide opening therebetween, to facilitate insertion of the wire. The closed, annular ring illustrated is preferred, however, since it insures positive retention of the wire.

A weighted sleeve **56,** in the form of an apertured cylinder or block of heavy material such as iron, etc., preferably is slipped over the wire between the guide ring **52** and the coil **40,** to prevent premature unwinding of more than the leading turn of the coil.

The switch **48** is of a type corresponding to the type of clutch, motor, or other drive means to be controlled. Thus, in the embodiment illustrated, if the clutch is of the electrical type, the switch also is of the electrical type and is connected in the electric circuit of the clutch to effect opening and closing of the circuit. On the other hand, if the clutch is of the fluid pressure type, either pneumatic or hydraulic, the control switch also is of the corresponding type of fluid pressure valve arranged in the fluid pressure circuit to apply and remove fluid pressure to and from the clutch. Accordingly, the lines **58** leading from the switch **48** may be electrical conductors or fluid conduits, depending upon the type of switch and clutch employed. Conveniently, the lines may be concealed for protection within the hollow post **44,** from the lower end of which they may be extended to the clutch and source of electrical or fluid pressure power, as will be apparent.

Further, it will be understood that the drive motor **36** may be of the electrical or fluid pressure type, as desired.

As mentioned previously, the switch arm **50** is movable arcuately between two positions of adjustment. In the broken line position the control switch **48** is adjusted to effect engagement of the clutch components **24** and **26** and consequent driving of the platform **12** rotationally in the clockwise direction of the coil winding. As a consequence, the outfeeding portion **40'** of the wire, which extends upward substantially parallel to the axis of the coil **40** and therefore also substantially parallel to the rotational axis of the platform **12,** is rotated clockwise from the broken line position to the full line position illustrated. This lateral movement of the outfeeding portion of the wire results in simultaneous clockwise rotation of the control switch arm **50.** It will be understood that the rotational speed of the platform **12** is greater than the rate of consumption, and hence outfeeding of the wire.

When the arm reaches the second position illustrated in full lines, the control switch **48** will have been moved to a position which causes disengagement of the clutch components **24** and **26** and consequent stopping of rotation of the platform.

It will be appreciated that the inertia of the rotating heavy wire coil and drum tends to cause the platform **12** to continue its clockwise rotation after the clutch components have been disengaged. Accordingly, means preferably is provided for minimizing this continued rotation. In the embodiment illustrated, such means is provided by braking mechanism arranged to releasably interengage the base and platform. Thus, a brake arm **60** is retractably extensible from conventional mechanism within a brake housing **62** mounted on the post **44** under the platform, or otherwise fixed relative to the base **10.** The brake mechanism may be operated manually, or, preferably, by the switch **48** through communicating lines **64.** Thus, when the control switch arm **50** reaches the second, full line position to effect disengagement of the clutch components, the control switch also functions to effect extension of the brake arm **60** into frictional engagement with the platform, to effect braking of rotation of the latter.

After the platform has ceased rotation, the welding wire continues to be pulled upwardly from the coil as it is consumed in the welding process. Thus, as the outfeeding portion **40'** of wire is pulled upwardly from the coil it moves laterally counterclockwise from the full line position illustrated toward the broken line position. During this counterclockwise movement the wire pulls the arm **50** arcuately counterclockwise with it until the arm is returned to the broken line position. In this position the control switch **48** has once again been moved to effect engagement of the clutch components **24** and **26** and simultaneously to effect retraction of the brake arm **60.** The platform thus is once again rotated in the clockwise direction, as previously explained.

The foregoing stepwise rotation of the platform, and consequent stepwise rotation of the coil of wire, results in uncoiling the latter without twisting or kinking. Moreover, the stepwise rotation of the platform is controlled automatically by the outfeeding wire, and at any variable rate at which the wire is consumed or otherwise drawn from the coil.

From the foregoing it will be appreciated that the present invention provides a simplified method and apparatus by which to uncoil a wide variety of coiled materials by paying out the coiled material in a direction substantially parallel to the axis of the coil, without twisting or kinking the material. The apparatus may accommodate the uncoiling of a plurality of coils independently of each other by the use of a single drive source. Operation of the apparatus is under the control of the outfeeding coiled material itself, and hence is dependent only upon the actual outfeed conditions. The apparatus thus renders practicable, for example, the

use of the much less expensive but much heavier and bulkier coils of welding wire for industrial welding applications.

It will be apparent to those skilled in the art that various changes may be made in the method steps and in the size, shape, number, type and arrangement of parts described hereinbefore, without departing from the spirit of this invention.

Having now described our invention and the manner in which it may be used, we claim:

1. Apparatus for unwinding coiled material, comprising

a. a base,

b. a platform mounted on the base for axial rotation and arranged to support thereon a coil of material from which the material is to be outfed in a direction substantially parallel to the axis of the coil,

c. drive means operatively engaging the platform for rotating the latter at a speed greater than the rate of unwinding of the coiled material,

d. drive control means associated with the drive means for effecting stepwise rotation of the platform at said greater speed in the direction of the winding of the coil of material, and

e. brake means arranged to releasably interengage the platform and base and operable to stop the rotation of the platform upon deactivation of the drive means.

2. Apparatus for unwinding coiled material, comprising

a. a base,

b. a platform mounted on the base for axial rotation and arranged to support thereon a coil of material from which the material is to be outfed in a direction substantially parallel to the axis of the coil,

c. drive means operatively engaging the platform for rotating the latter at a speed greater than the rate of unwinding of the coiled material, the drive means including a drive motor and clutch means releasably interengaging the drive motor and platform, and

d. drive control means associated with the clutch means for engaging and disengaging the latter for effecting stepwise rotation of the platform at said greater speed in the direction of the winding of the coil of the material.

3. Apparatus for unwinding coiled material, comprising

a. a base,

b. a platform mounted on the base for axial rotation and arranged to support thereon a coil of material from which the material is to be outfed in a direction substantially parallel to the axis of the coil,

c. drive means including a drive motor and clutch means releasably interengaging the drive motor and platform for rotating the latter at a speed greater than the rate of unwinding of the coiled material, and

d. drive control switch means operatively associated with the clutch means for effecting stepwise rotation of the platform at said greater speed in the direction of the winding of the coil of the material, the intermittent rotation of the platform resulting in lateral movement of the outfeeding portion of the material relative to the coil thereof, and the drive control switch means includes means operable by the laterally moving outfeeding portion of the coil material for intermittently actuating the switch means and starting and stopping rotation of the platform.

4. The apparatus of claim **3** including brake means arranged to releasably interengage the platform and base and operable by the control switch means in the platform stopping position to stop the rotation of the platform upon deactivation of the clutch means.

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