Oct. 1, 1968 A. GARABOUX 3,403,870

WEB WINDING MACHINE

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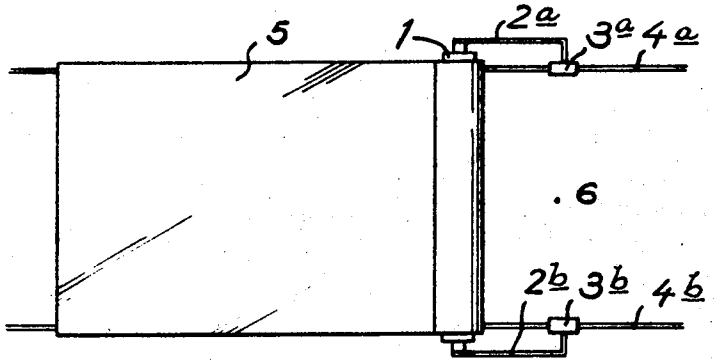
Fig. 1


Fig. 2



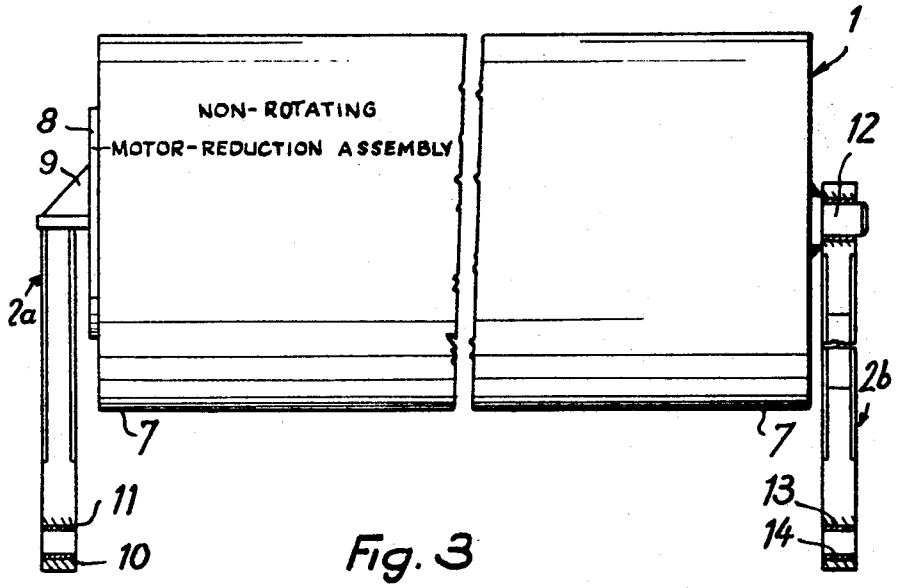




Fig. 3

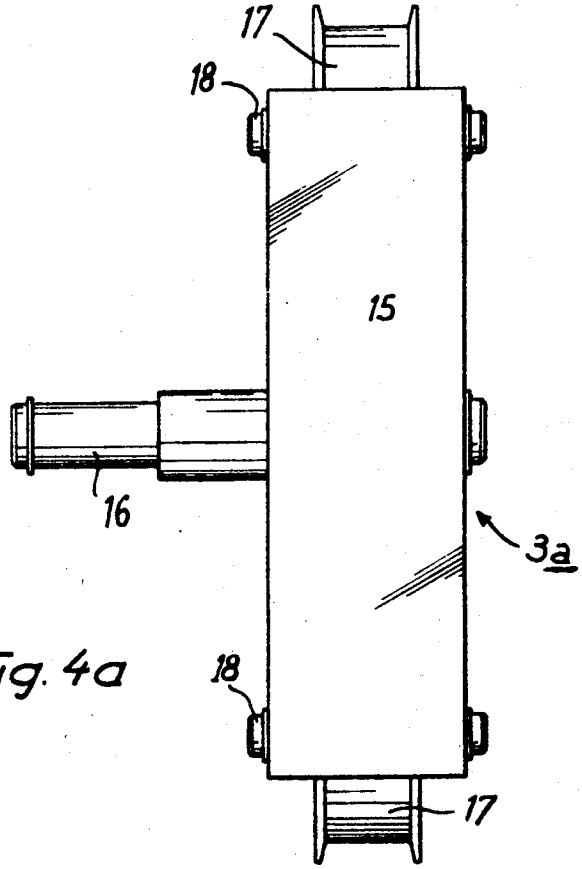



Fig. 4a

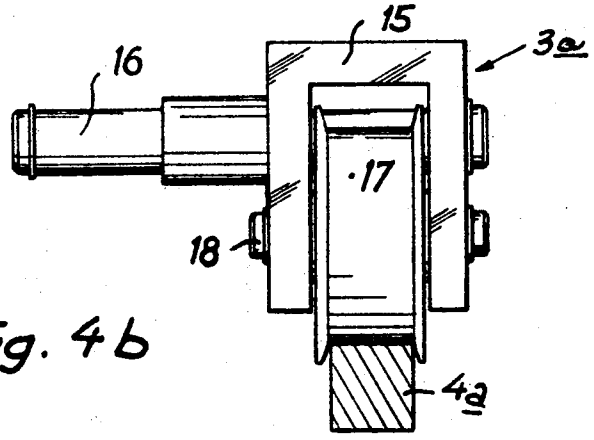



Fig. 4b

Fig. 5a

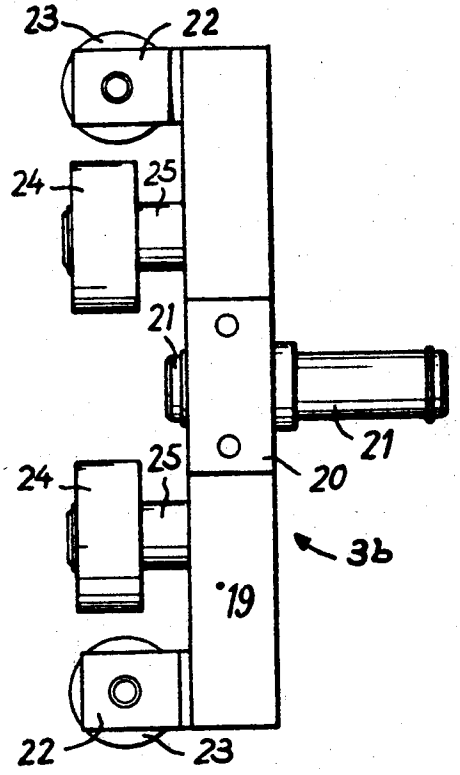
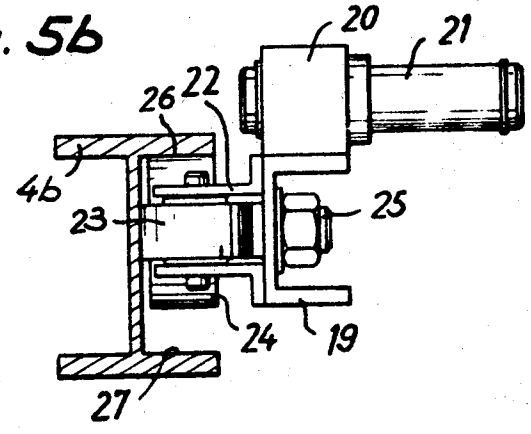



Fig. 5b



WEB WINDING MACHINE

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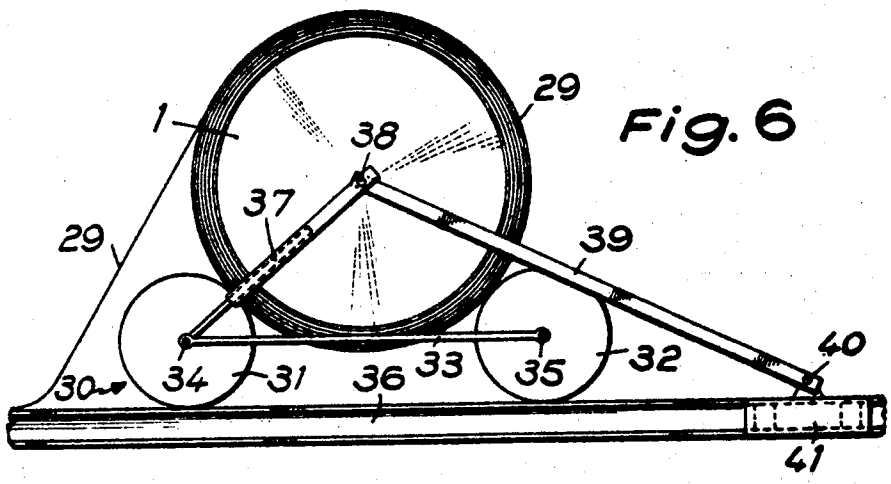


Fig. 6

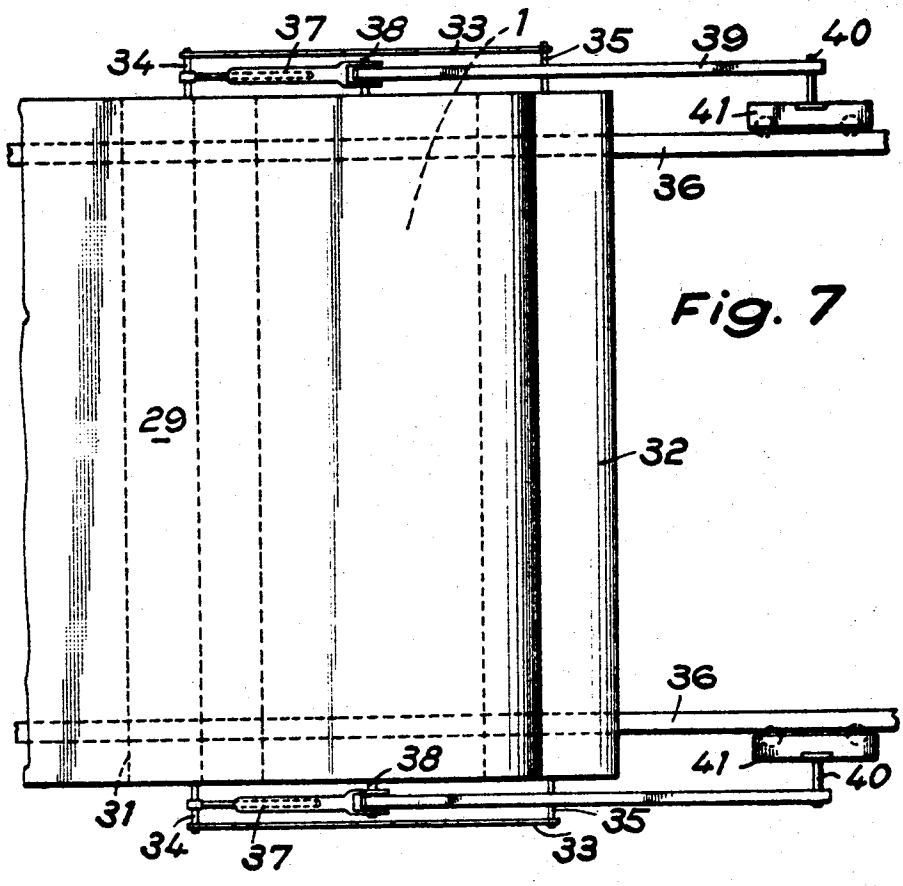


Fig. 7

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WEB WINDING MACHINE

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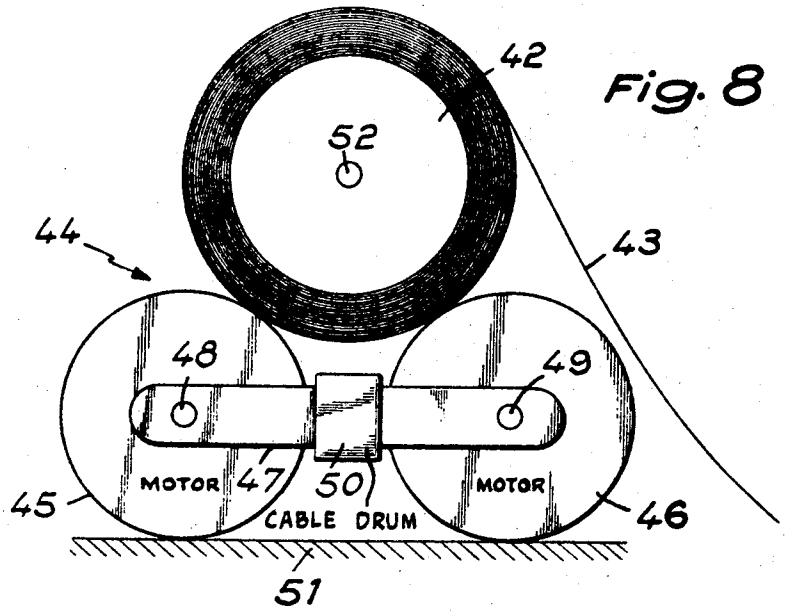


Fig. 8

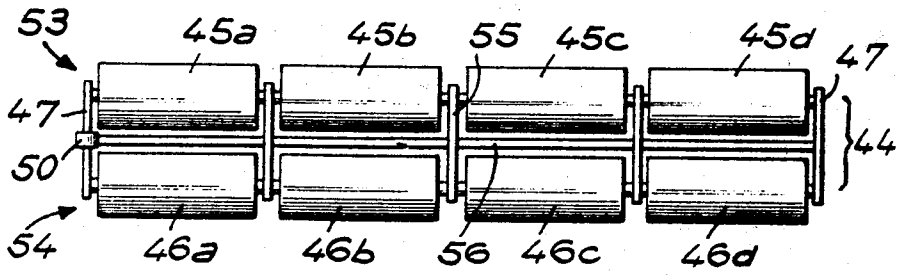


Fig. 9

United States Patent Office 3,403,870 Patented Oct. 1, 1968



3,403,870

# WEB WINDING MACHINE

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Filed Nov. 28, 1966, Ser. No. 597,297
Claims priority, application France, Dec. 3, 1965, 40,934;
Jan. 31, 1966, 47,876
15 Claims. (Cl. 242—86.52)

## ABSTRACT OF THE DISCLOSURE

Apparatus for rolling and unrolling sheet-like elements comprising a propelled cylindrical means around which the elements are to be wound, a reduction-drive assembly incorporated in the cylindrical means for rotatably driving the cylindrical means, and means for guiding and supporting the cylindrical means.

Generally, when there is a working surface, an open vessel or other surface to be covered or uncovered with a tarpaulin, curtain, etc., without chafing occurring between the cover and the surface or covered object, it is necessary to wind the cover on itself or on a cylindrical support whilst moving the winding axis of the cover in the direction of covering or uncovering of the surface.

The simplest means for manoeuvering a tarpaulin in this manner on a flat surface for example, is to do it manually.

When the surface to be covered is inclined, it is also possible to proceed in the same manner as when manoeuvering certain types of blind, that is to say by rolling the cover on itself or on a tube with the aid of a cord, and allowing the weight of the element to unroll it under the force of gravity. Such a method is particularly convenient for greenhouses, but cannot be used when the surface to be covered is flat.

Thus, up to the present time, such covers have been manoeuvered manually, and this obviously requires manpower and takes up much time if the surface to be covered or uncovered is at all large and if the process has to be frequently repeated.

A particular object of the present invention is to mechanize the operations described above and to eliminate the inconveniences thereof by enabling the rolling-up and unrolling of a cover to be performed rapidly and automatically whatever may be the inclination of the surface to be covered.

With this in view, the invention provides an apparatus for the rolling-up and unrolling of covers such as tarpaulins, curtains, screens, matting, etc., characterized in that it includes, in combination, a tube on which the cover is adapted to be wound, and means for rotatably driving and means for guiding the tube.

Other advantages and characteristics of the invention will appear from the following description of various embodiments of the apparatus for rolling up and unrolling tarpaulins, such description being by way of example only and with reference to the accompanying drawings in which:

FIG. 1 shows a side view of a self-propelled apparatus for rolling up and unrolling tarpaulins;

FIG. 2 is a plan view of the apparatus shown in FIG. 1;

FIG. 3 is a view in section of two counter arms of the apparatus of FIGS. 1 and 2;

FIGS. 4*a* and 4*b* are respectively views from above and from the side of the guiding means of the apparatus of FIGS. 1 and 2;

FIGS. 5*a* and 5*b* are respectively view from above and from the side of an other form of guiding means which may be used with the apparatus of FIGS. 1 and 2;



FIG. 6 is a transverse elevation of another embodiment of the apparatus of the invention;

FIG. 7 is a view from above of the apparatus of FIG. 6;

FIG. 8 is a transverse elevation of a simplified embodiment of the apparatus of FIG. 6;

FIG. 9 is a view from above of another embodiment of the apparatus of the invention.

Referring to FIGS. 1 and 2, the tube designated **1** is of the type having a motor-reduction assembly incorporated therein. The tube **1** is provided at the extremities of its axis of rotation with parallel counter and guiding arms **2***a*, **2***b* having at their free ends guiding means **3***a*, **3***b* for movement along two parallel guide tracks **4***a*, **4***b*. The tracks **4** carry both the self-propelled tube **1** and a tarpaulin **5** secured thereon by any suitable means (not shown). The tarpaulin is disposed between the tracks **4***a*, **4***b* and above an enclosure **6** to be covered or uncovered.

In FIG. 3, the winding drum of the tube **1** is designated by **7** and the end of the motor reduction assembly by **8**. In order to ensure that this extremity **8** does not rotate, by reaction, when the motor is started, it is necessary to stabilize it with a counter arm **2***a* by means of a reinforcing bracket **9**.

The other end of the arm **2***a* is provided with a bore **10** carrying a bronze bush **11**.

The winding drum **7** of the self-propelled tube is rigidly secured at its other end to a shaft **12** on which is freely mounted an auxiliary guiding arm **2***b* having at its free end a bore **13**) provided with a bronze bush **14**.

From FIGS. 4*a* and 4*b*, it will be seen that the guiding means **3***a* associated with the arm **2***a* is constituted by a yoke **15** forming a counter-weight, secured to a shaft **16** on which is freely mounted the counter arm **2***a*. The counter-weight formed by the yoke **15** is necessary because the self-propelled tube **1** is adapted to roll up the tarpaulin **5** as well as to unroll it, and consequently the arm **2***a* must be immobilized in both directions of rotation. Thus, in the direction of rolling-up of the tarpaulin **5**, the arm **2***a* will, by reaction, press the yoke **15** towards the ground and will therefore be prevented from rotating in the unrolling direction of the tarpaulin **5**, the arm **2***a* will tend, by reaction, to raise the yoke **15** which, by virtue of its own weight, will prevent the arm **2***a* from turning.

The yoke **15** carries two rollers **17** freely mounted on shaft **18** and running along the guide track **4** constituted by a rail **4***a*.

The other arm **2***b*, not being a counter arm, serves simply as a guide arm and has, at its free end, a guiding means identical with the means **3***a*, but with a lighter yoke, or alternatively, any other guiding means associated with the guide track **4***a* or with any other guide track.

FIGS. 5*a* and 5*b* show a variant **3***b* of the guiding means **3***a* associated with the arm **2***a*. This variant of the guiding means acts by being enclosed, and no longer as a counter-weight as previously described.

The guiding means **3***b* comprises a U-shaped iron member **19** having at its center a bearing **20** in which is freely mounted a shaft **21**, itself freely mounted in the bore **10**. At the two ends of the member **19**, and on the same side, are secured two yokes **22** carrying horizontal rollers **23**. Third and fourth vertical rollers are mounted, between the two other rollers **23**, on shafts **25** parallel to the shaft **21** and rigidly secured to the member **19**.

These four rollers roll on a guide track **4** constituted by an I-shaped iron member **4***b*.

The rollers **24** rest on either of the faces **26** and **27** of the member **4***b* according to the direction of rotation of the self-propelled tube **1**, whilst the rollers **23** provide a guiding action for the rollers **24** on the faces **26** or **27**.

One can, of course, use other guiding means suitable for use with the arms **2***a* and **2***b* and associated with parallel guiding shafts or other means running in the

direction of movement of the tube 1, without departing from the scope of the invention.

In the same way, one can provide a rapid and easy fixing device for the drum 7, on the one hand on a solid support of the shaft 12, and on the other, at the other end of the drum 7, on the driving portion of the motor reduction assembly so that only the drum 7 is immobilized by the trapaulin 5 wound thereon and the motor reduction assembly, the arms 2 and guiding means 3 can be used with other drums.

Moreover, the winding and unwinding apparatus described above can have its own means for ensuring the mechanical coupling and uncoupling of the tarpaulin 5, as well as means to ensure a linear speed of the self-propelled tube 1 and by varying the angular speed of this tube, for example by using an automatically adjustable rheostat.

Again, when there is a question of a surface to be covered rather than an enclosure, it is possible to roll the self-propelled tube directly along this surface instead of along the guide tracks 4, provided the surface can support the tube.

The arms and guiding means as well as the guide tracks can be dispersed with, and the self-propelled tube 1 used, with an appropriate adaptation and manual or remote control guiding means, as a cylinder adapted to move by itself on any surface to wind or unwind any flexible element. Such elements may be not only tarpaulins, curtains, screens or matting, but also wires, cables, pipes, bands, etc. The apparatus can even constitute a self-propelled vehicle for use in agriculture, particularly as a roller.

Finally, the electric rotation driving means of the tube 1 can be replaced by manual means, for example a crank handle keyed in the axis of the tube 1.

A variant of the apparatus is shown in FIGS. 6 and 7.

When the cover is a tarpaulin, a woven material, or more generally a fragile and delicate material, the localised compression and shearing stresses exerted on the cover at the level of contact with the rails 4 produces the risk of deteriorations occurring in the cover.

The embodiment shown in FIGS. 6 and 7 has precisely the object of eliminating this disadvantage and redistributing the compression stresses uniformly over the whole length of the cover.

To this effect, the self-propelled tube 1 is disposed on a cradle 30 constituted by two tubes 31 and 32 parallel to the tube 1 and ridigly connected together by two coupling bars 33 rotatably mounted at the ends of the axles 34 and 35 of the tubes 31 and 32, the length of the bars being such that the tube 1, when empty, does not rest on the guide track constituted in this example by the rail 36.

In addition, a telescopic arm 37 is rigidly secured, at each of its ends, to the shaft 38 integral with the stationary portion of the driving motor of the tube 1, and at its other end by a pivot to the axle 34 of the tube 31.

Two guiding arms 39 are provided, freely mounted, on the one hand on the two ends of the shaft 38 of the tube 1, and on the other, on the shafts 40 of two yokes carrying horizontal rollers 41.

When it is desired, for example, to roll up the tarpaulin 29 on the tube 1, the latter is turned in a clockwise direction. By reaction, the telescopic arms 37 tend to urge the tube 31 towards the rails 36 and thus constitute the counter arms of the self-propelled apparatus. On the other hand, since the self-propelled tube rests continually, by gravity, on the tubes 31 and 32 of the cradle 30, the two tubes 31 and 32 are not in rotation by friction, in an anti-clockwise direction, so that the cradle 30 moves from the right to the left as seen in FIG. 6, a distance strictly equal to the length of tarpaulin wound on to the tube 1.

In fact, the tubes 31 and 32 continually roll on the apparent periphery of the self-propelled tube 1, that is to say on the last wound layer of tarpaulin, so that the amount of travel at the periphery of the tubes 31 and 32 corresponds to the length of travel along the rails 36, to which in turn corresponds an equal length of tarpaulin defined during the last winding turn in contact with the tubes 31 and 32.

There is thus obtained a synchronization between the movement of the cradle 30 in rolling up the tarpaulin 29 and the detachment of the latter from the covered surface. Conversely, the same synchronization prevails during unrolling of the tarpaulin 29 in the opposite direction.

Guiding of the apparatus is effected by the arms 39 with which are associated roller carrying yokes 41 cooperating with the rails 36. It is, however, possible to effect such guidance by arms rigidly fixed or not according to the form of the guiding tracks, on the one hand on the coupling bars 33 and on the other on the roller carrying yokes 41.

FIG. 8 shows a simplified version of the apparatus illustrated in the FIGS. 6 and 7. In FIG. 8, the self-propelled apparatus is constituted by a tube 42 on which is wound the cover 43. The tube 42 rests on a cradle 44 constituted by two parallel tubes 45 and 46 joined at their ends by a coupling bar 47 rotatably mounted on the shafts 48 and 49 of the tubes 45 and 46.

The electric driving motor or motors are mounted in the interior either of the tube 45 or tube 46 or in both tubes 45 and 46.

The apparatus includes, moreover, a cable drum 50 mounted on the coupling bar 47 and connected, on one hand, to supply connections for the motor or motors, and on the other hand, to a fixed current take-off point not shown and disposed outside the guide track 51.

The rotating part of the motors is rigid with the tube to be driven whilst the stationary part of the motors is rigid with the coupling bar 47. In the case where several motors are provided, they will, of course, operate in synchronism.

The driving in rotation of the tube 42 is effected in this embodiment by friction with the tube or tubes 45 and 46, the tube 42 being maintained on its cradle by its own weight.

Since the tube 42 is not self-driven, it is no longer necessary to provide the telescopic counter arms connecting the shaft 52 of the tube 42 to one of the shafts of the tubes 45 or 46.

However, in a manually driven variant of the apparatus, if the tube 42 is driven by means of a crank handle for example keyed to the shaft 52, it is useful to provide a telescopic arm identical to that described above thus to maintain the tube 42 on its cradle.

This kind of problem is no longer presented if one of the tubes 45 or 46 is rotated in a similar manner.

In FIG. 9, the apparatus is constituted by a tube of great length (or several tubes end to end), not shown in the drawing and remaining by its own weight on a cradle 44 formed by two parallel rows 53 and 54. The rows 53 and 54 are formed by tube portions (45*a*, 45*b* . . ., 46*a*, 46*b* . . .) of equal length set end to end and mutually separated by small gaps.

In these gaps between tube portions are provided coupling bars 55 similar to those at the ends 47 for connecting together the shafts of the tubes (45*a*, 45*b* . . .) and the tubes (46*a*, 46*b* . . .).

The apparatus comprises, moreover, a cable drum 50 mounted at one end of the cradle chassis constituted by the coupling bars 47 and 55.

The cable drum 50 is connected to electric motors which are mounted in the interior of one and/or the other of tubes 45*a* and 46*a* and also within one and/or the other of tubes 45*d* and 46*d* at the other end of the apparatus. The supply lines to the latter are supported by a cross member 56 connecting together the coupling bars 47 and 55. The drum 50 is also connected to a fixed

current take-off point not shown and disposed for example midway along the surface to be uncovered or covered.

Naturally, to increase the power of the apparatus, a greater number of electric motors can be provided, each being disposed in one of the cradle tubes and having its stationary portion fixed to one of the intermediate coupling bars 55.

Moreover, it is possible to provide, for the two embodiments described above, guiding means along the surface to be covered or uncovered, such means being, for example, guiding rails with which cooperate roller carrying yokes mounted at the ends of the arms which are themselves mounted at their other ends on the cradle.

The present invention is not limited to the embodiments described above but covers all variants thereof.

What I claim is:

1. Apparatus for rolling and unrolling sheet-like elements comprising; propelled cylindrical means around which said elements are to be wound; reduction-drive assembly means for rotatably driving said cylindrical means and incorporated in said cylindrical means; a portion of said reduction-drive assembly means being stationary with respect to said cylindrical means; means for guiding and supporting said cylindrical means; and reaction means for preventing rotation of said stationary portion of said reduction-drive assembly means including at least one arm, one end of said arm being rigid with said stationary drive portion, and countering means on the other end of said arm maintaining said arm against the path of travel of said cylinder.

2. Apparatus according to claim 1, wherein said countering means comprises a yoke member, two rollers supported on said yoke for rotation about a horizontal axis, a channel being provided running parallel to the direction of movement of said cylindrical means, said rollers being adapted to run along said channel.

3. Apparatus according to claim 2, comprising a counter-weight attached to said yoke, said rollers being adapted to roll along a rail parallel to the direction of movement of said cylindrical means.

4. Apparatus according to claim 2, comprising two auxiliary rollers constituting said guiding means and mounted on said yoke for rotation about a vertical axis, said auxiliary rollers being adapted to roll along the bottom of the said channel.

5. Apparatus according to claim 1, wherein said at least one arm constitutes said guiding means.

6. Apparatus according to claim 1, including at least one auxiliary guiding arm associated with said at least one arm.

7. Apparatus according to claim 6, including a shaft fixed to the moving part of said cylindrical means, on which shaft said auxiliary guide means is freely mounted.

8. Apparatus for rolling and unrolling sheet-like elements comprising; propelled cylindrical means around which said elements are to be wound; reduction-drive assembly means or rotatably driving said cylindrical means and incorporated in said cylindrical means; a portion of said reduction-drive assembly means being



stationary with respect to said cylindrical means; means for guiding and supporting said cylindrical means; reaction means for preventing rotation of said stationary portion of said reduction-drive assembly means; and a supporting cradle disposed between said cylindrical means and a surface over which said cylindrical means is to travel, said cradle being constituted by two cylindrical members parallel to said cylindrical means, connecting bars rigidly connecting said members between their longitudinal axes, said members being adapted to be driven by frictional contact with successive layers of sheet-like element rolled onto said cylindrical means, and to roll along the path of travel of said latter.

9. Apparatus according to claim 8, including a telescopic arm rigidly connected towards one end to said stationary drive portion, and a pivot-assembly connecting its other end to the axis of one of said cylindrical members of said supporting cradle.

10. Apparatus according to claim 8, comprising at least two guiding arms, each pivotally connected at one end to said cylindrical means at the axis of rotation of the latter, a roller-carrying member attached to each other end of said guiding arms, guide rails constituting said path of travel of said cylinder and rollers on said roller-carrying member cooperating with said rails.

11. Apparatus according to claim 8 wherein said reduction-drive assembly means includes at least one electric motor disposed within at least one of said two cylindrical members of said cradle, said stationary driving portion being rigidly fixed by one of said connecting bars.

12. Apparatus according to claim 11 including a cable drum for carrying an electric current feed cable for said at least one electric motor, said drum being mounted on a portion of said cradle.

13. Apparatus according to claim 8, wherein said cradle comprises two parallel rows of axially aligned and oppositely disposed cylindrical portions mounted on axles, and coupling bars joining opposite axle portions between opposite pairs of said cylindrical portions.

14. Apparatus according to claim 1 wherein said reduction-drive assembly means includes a portion mounted exteriorly of said cylindrical means and is attached to a portion of said cylindrical means in alignment with its axis of rotation.

15. Apparatus according to claim 8 wherein said reduction-drive assembly means includes a portion mounted exteriorly of said cylindrical means and is attached to one of said cylindrical members in alignment with its axis of rotation.

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