

[54] **ELECTROMECHANICAL APPARATUS
FOR SLINGING AND TURNING OVER
ROLL MATERIAL**

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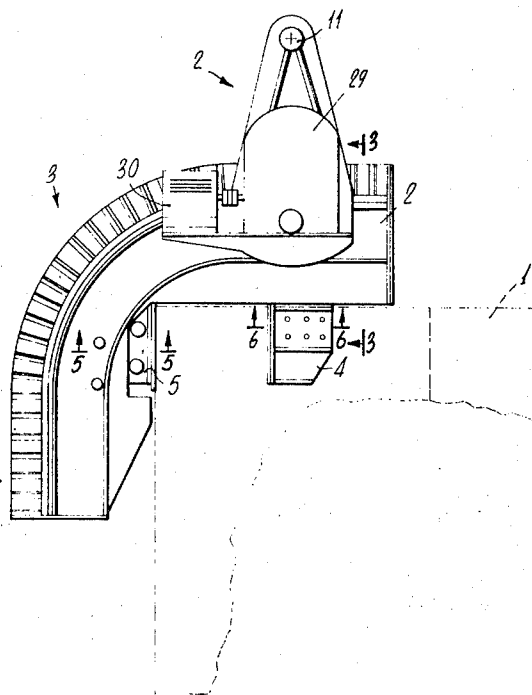
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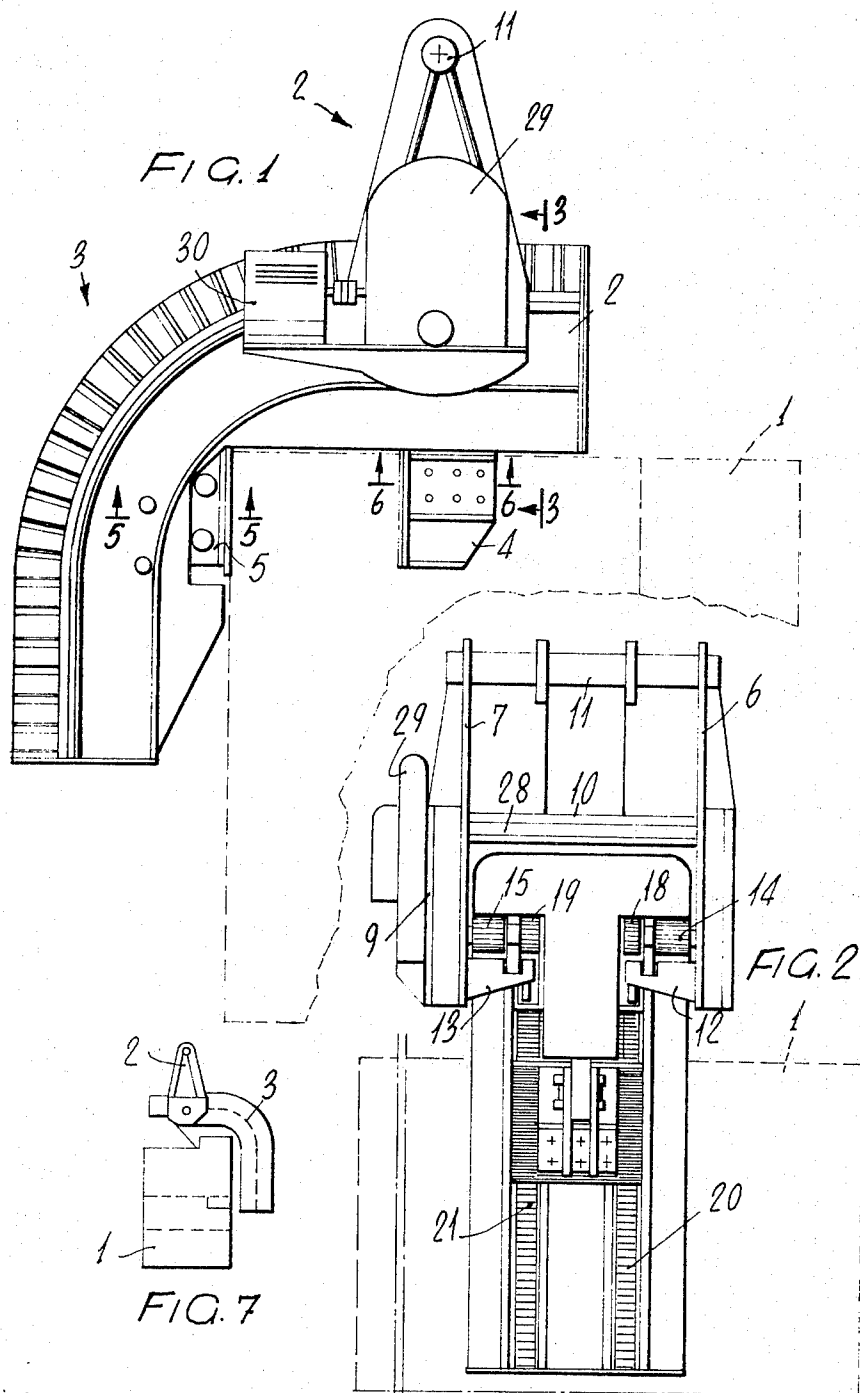
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[57] **ABSTRACT**

An electromechanical apparatus for turning over roll material, substantially comprising two parts movable with respect to each other and particularly a first drive part adapted to be hung to the hook of a lifting means and carrying a drive motor and a reducing unit, and a second part comprising a boxed L-beam having its legs interconnected by a circle arc section; at said connection, one leg of said L-beam carrying a fixed jaw cooperating with a jaw movable on guides along said leg to grasp a material roll to be lifted and turned over. Said L-beam has longitudinal sliding guides on the first part as well as racks meshing with suitable pinions driven by said reducing unit for longitudinally sliding with respect to said first driving part.

9 Claims, 7 Drawing Figures



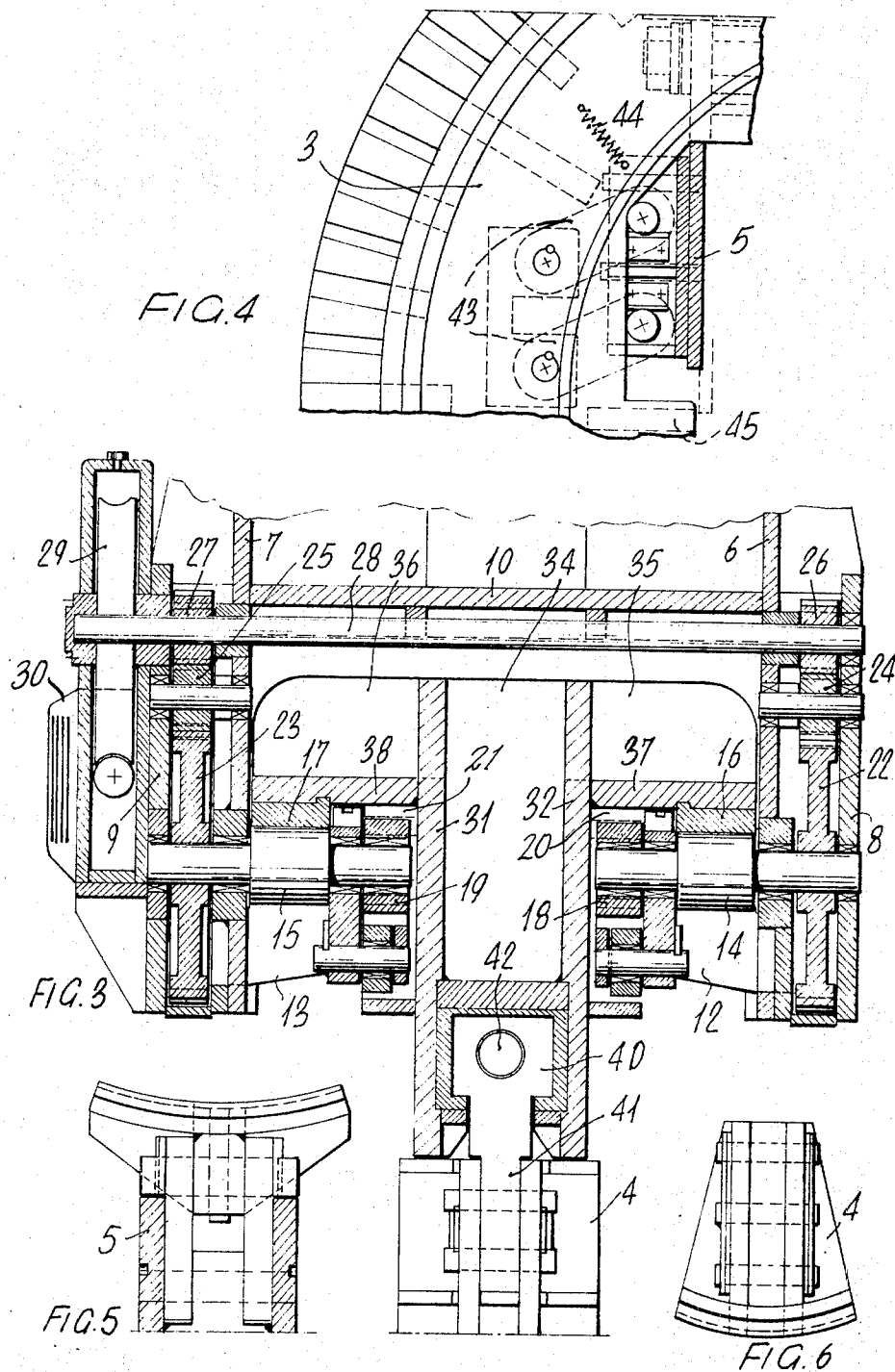


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ELECTROMECHANICAL APPARATUS FOR SLINGING AND TURNING OVER ROLL MATERIAL

This invention relates to an electromechanical apparatus generally used for lifting and rotating or turning over roll material and particularly for slinging and rotating roll sheet material from vertical to horizontal positions, or vice versa.

As is well known, at present there is the need in industries of practically and reliably moving the sheet rolls, independently of the horizontal or vertical position of their axis. Thus, such rolls are generally unloaded and stacked on one another either at a vertical position or at a horizontal position, whereafter such rolls may be used for feeding operating machines.

In addition to the above requirements, there is also the need of carrying out all of said operations by a single equipment, avoiding the use of such ancillary apparatuses as a ground turn over machine. Such machines require, as is well known, the alternation at the crane hook of two different slinging devices, one of which is used for unloading a roll in a vertical position on the turn over machine and for turning over the roll to a horizontal position and the other of which is used for removing it at a horizontal attitude, and vice versa. There is also the need of taking advantage as far as possible of the level of storage sites accommodating the sheet rolls with a resulting maximum exploitation of the useful levels of the crane hooks.

All of these requirements have never been met by the devices existing at present, devices which render therefore the roll slinging and rotating operations time consuming and sometimes difficult. Further, the devices existing at present are quite heavy and large in overall size, it being thus impossible to fully take advantage of the lifting crane capacities and the height capabilities of the roll storage sites.

Therefore, it is the object of the present invention to provide an electromechanical apparatus for slinging and rotating roll material and particularly metal rolls, which apparatus meets all the above mentioned requirements and is reliable, and is of a comparatively light weight and limited overall size.

The electromechanical apparatus for roll slinging and rotation according to the invention essentially comprises two parts movable relatively to each other; a first part of which being fixed and suitable to be hung to the hook of a lifting means and which supports and guides the second movable part of the apparatus, this latter part comprising a boxed L-beam having its legs which are connected to one another by a circle arc section and supporting a pair of opposite jaws for roll slinging, one of said jaws being fixed, while the other is movable in either direction along guides formed longitudinally of one leg of said L-beam, the apparatus also comprising means for rotating in either direction and on a vertical plane said second part relative to the first part, and means for moving said movable part along said guides.

For a more clear understanding of the invention, reference will be had hereinafter to the appended drawings, in which:

FIG. 1 is a side view showing the apparatus according to the invention;

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

FIG. 3 is a cross-section of the apparatus substantially taken along line 3—3 of FIG. 1;

FIG. 4 is a detail of the supporting system for the outer jaw;

FIG. 5 is a sectional view of the outer jaw as taken along line 5—5 of FIG. 1;

FIG. 6 is a sectional view of the inner jaw as taken along line 6—6 of FIG. 1; and

FIG. 7 is a diagrammatic side view showing the apparatus at a position opposite to that in FIG. 1;

Referring to FIGS. 1 through 3, it will be seen that the apparatus for slinging and rotating a sheet roll designated at 1 substantially comprises two parts 2 and 3, the first fixed part 2 of which is arranged for hanging from the hook of a general lifting means (not shown) and is adapted to support and rotate in either direction on a vertical plane the second movable part 3 which substantially comprises a boxed L-beam having its straight legs interconnected by a circle arc section. The second part or L-beam 3 is provided with a pair of jaws, 4 and 5 respectively, the inner jaw 4 of which (relative to roll 1) moves on proper guides formed longitudinally of one leg of said L-beam, as discussed below in more detail.

As shown in FIGS. 2 and 3, said first part 2 of the apparatus comprises a pair of primary spaced apart sides 6 and 7 reinforced by two secondary sides 8 and 9, these sides being interconnected by an intermediate cross beam 10 and an upper shaft 11 adapted to be inserted in the hook of the general lifting means (not shown).

At the lower ends of the sides there are inwardly facing brackets 12 and 13 respectively, supporting a respective rolling pin 14 and 15, the associated guiding surfaces 16 and 17 of the apparatus part 2 bearing thereon. Each rolling pin has its end portions of a smaller diameter, on which there are respectively secured a gear suitably controlled for pin rotation and a toothed pinion meshing with a rack carried by the apparatus part 3 to drive the latter.

Particularly referring to FIG. 3, it will be seen that at its inner end each rolling pin has a tooth pinion 18, 19 meshing with an associated rack 20, 21 (FIG. 2) on the second part 3 of the apparatus, as discussed below in more detail. At the other end of each rolling pin, or the outer end, a gear 22, 23 is keyed and which through an intermediate idle gear 24, 25 is coupled to a further gear 26, 27 which is connected to a shaft 28. Through a suitable r.p.m. reducing device 29, located sidewise on the side of the part 2 of the machine, said shaft 28 is driven by a suitable electric motor 30 (FIG. 1) to simultaneously rotate said rolling pins 14 and 15 which through their associated tooth pinions 18 and 19 will drive the apparatus part 3 in either direction.

Let us now consider the second movable part 3 of the apparatus. This part is of a substantially T-shaped cross-section and, as shown in FIG. 3, comprises two parallel main L-ribs 31 and 32 interconnected by spacer cross beams 34 forming a boxed structure having said L-profile. Some of the spacer cross-beams along the boxed structure or L-beam have two parts or legs 35 and 36 projecting in opposite directions and suitable to support associated longitudinal brackets 37 and 38 for supporting the guiding plates 16 and 17 and said racks 20 and 21.

At the bottom and between said main ribs 31 and 32 the sliding guides are formed for a scroll 40 having a lower extension 41 supporting said inner jaw 4. Said scroll 40 engages a screw 42 driven by a suitable motor (not shown) which is carried internally of the apparatus part 3 for causing said jaw 4 to slide longitudinally on the leg of said L-beam on which jaw 4 is carried.

The other jaw or the outer jaw (relatively to the sheet roll to be slinged) is carried by the other leg of said L-beam, so that limited longitudinal movements are allowed thereto and towards the inner jaw to provide for self-tightening jaws.

This is clearly shown in FIG. 4, wherein the outer jaw 5 is supported by said L-beam 3 through connecting rods 43 pivoted by one end thereof to said jaw 5 and by the other end thereof to said L-beam structure for allowing said jaw 5 to move through a short distance. A spring 44 is connected between said L-beam and jaw 5 for holding the latter at its lifted position, whereas an abutment 45, shown by dashed lines in FIG. 4, prevents said jaw 5 from moving down beyond a given limit. Thus, should a slinged roll attempt to slide, this would downward draw the jaw 5, the latter tending to increasingly press against the roll and preventing it from falling down.

By way of example, FIGS. 5 and 6 of the appended drawings show cross-sections of said jaws 4 and 5; as it will be seen, the outer jaw 5 has a convex gripping surface for better adhering to the roll surfaces. It is apparent that the bending radii for the two gripping surfaces have to be properly calculated in order to accommodate sheet rolls of different diameters.

The operation of the apparatus just described is very simple and as follows: assume that it is required to move or unload a sheet roll which is vertically arranged and to set it at a horizontal attitude. Then, after setting the apparatus at the open jaw position, such as in FIG. 1, the roll 1 is grasped by closing said jaws 4 and 5, then the entire apparatus is lifted, such as by a crane, drawing along said roll 1. When said roll has been lifted to a given level then motor 30 is operated which through the reducing gear 29, shaft 28 and gears 23, 27 and 22, 26 will rotatably drive said rolling pins 14 and 15 which by their toothed pinions meshing with the associated racks will drive the apparatus part 3 causing it to move so as to take a position rotated by 90°, as schematically shown in FIG. 7. When the apparatus is under this situation, the roll 1 is rotated by 90°, its axis is horizontally arranged, and thus it can be stacked or supplied to an operating machine.

Obviously, from the foregoing it should be understood that the apparatus according to the invention is highly versatile, practical and reliable. Thus, since the present equipment maintains the load gravity center substantially always on the vertical lifting axis, this equipment having its jaws driven by an irreversible screw is always reliable even in the case of sudden current failures. It should also be understood that the foregoing, as described and shown, was given by mere way of example and that further changes may be made thereto without departing from this from the covering field of the invention.

What is claimed is:

1. An apparatus for slinging and rotating sheet rolls, the apparatus substantially comprising two parts mov-

ble respectively to each other a first fixed part of which, adapted to be hung to the hook of a lifting means, supports and guides the second movable part of the apparatus, this latter part comprising a boxed L-beam having its legs interconnected by a circle arc section and supporting a pair of opposite jaws for roll slinging, one of said jaws being relatively substantially fixed, while the other is movable along guides formed longitudinally of one leg of said L-beam, the apparatus further comprising first planar support means extending along one leg of the second part and second planar support means extending along a second leg of the second part for supporting the second part on the first part and curved support means joining the planar support for rotating in either direction on a vertical plane said second part relative to said first part, and means for moving said movable jaw in either direction.

2. An apparatus according to claim 1, wherein said first part of the apparatus is provided with rolling pins, wherein the support means comprise guiding surfaces of said second part of the apparatus bearing on the rolling pins.

3. An apparatus according to claim 2, wherein said planar and curved support means for supporting and for rotating the second part of the apparatus in either direction further comprise first and second straight racks joined by a curved rack, and further comprising at one end of each of said rolling pins a toothed pinion, this pinion meshing with a corresponding rack carried by the second part of the apparatus, the other end of each rolling pin being connected through gears to a common operating shaft driven by a motor located on the first part of the apparatus.

4. An apparatus according to claim 3, wherein said common operating shaft is connected to said motor by a r.p.m. reducing device.

5. An apparatus according to claim 3, wherein the second part of the apparatus or boxed L-beam is of a substantially T-shaped cross-section, wherein the guiding surfaces and said racks are located under the lower surfaces of said L-beam legs.

6. An apparatus according to claim 1, wherein said means for moving said movable jaw in either direction comprise a pair of guides formed longitudinally of one of said L-beam legs, a scroll sliding in said guides and carrying at the bottom said movable jaw, said scroll engaging a screw driven by a suitable motor.

7. An apparatus according to claim 1, wherein said second jaw is carried by the other leg of said L-beam relative to the leg carrying the movable jaw, and at least one of said two jaws can independently move to the other for providing a self-pressing gripping action.

8. An apparatus according to claim 1, wherein the load gravity center is substantially always on the vertical lifting axis.

9. An apparatus for slinging and rotating sheet rolls, the apparatus substantially comprising two parts movable to each other a first fixed part of which, adapted to be hung to the hook of a lifting means, supports and guides the second movable part of the apparatus, this latter part comprising a boxed L-beam having its legs interconnected by a circle arc section and supporting a pair of opposite jaws for roll slinging, one of said jaws being substantially fixed, while the other is movable along guides formed longitudinally of one leg of said L-

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beam, the apparatus further comprising means for rotating in either direction on a vertical plane said second part relative to said first part, and means for moving said movable jaw in either direction, wherein the respective jaws are carried on respective legs of the L-beam, and wherein the jaw which is relatively fixed

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with respect to the movable jaw is connected to its leg by pairs of connecting rods pivoted at first ends thereof to said L-beam leg for allowing said jaw to move through a short distance towards the movable jaw to provide for self pressing action.

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