Sept. 14, 1965 L. M. LAING ETAL 3,206,049

TURNOVER CRADLE

Filed March 26, 1963 4 Sheets-Sheet 1

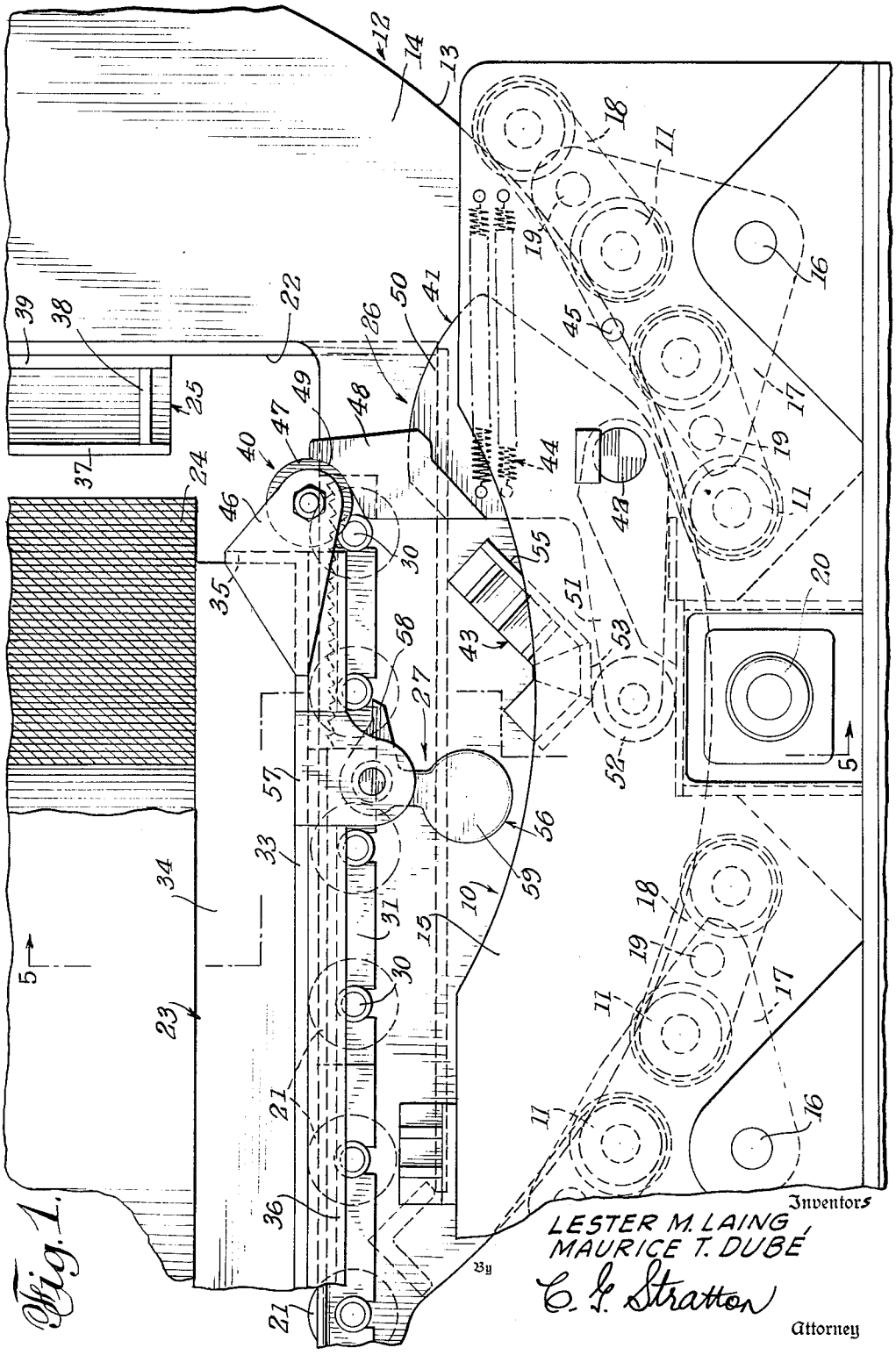


Fig. 1.

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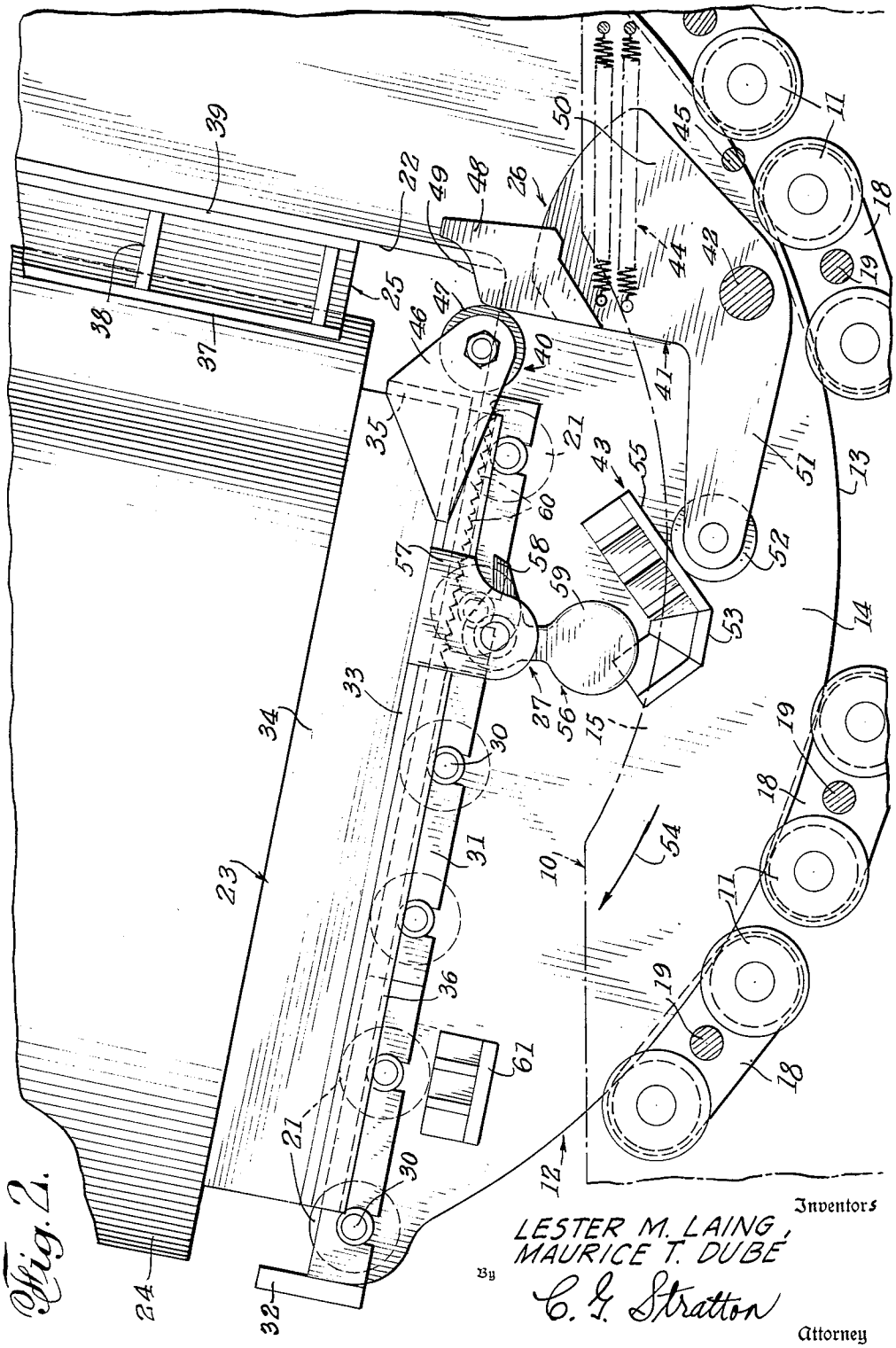


Fig. 2.

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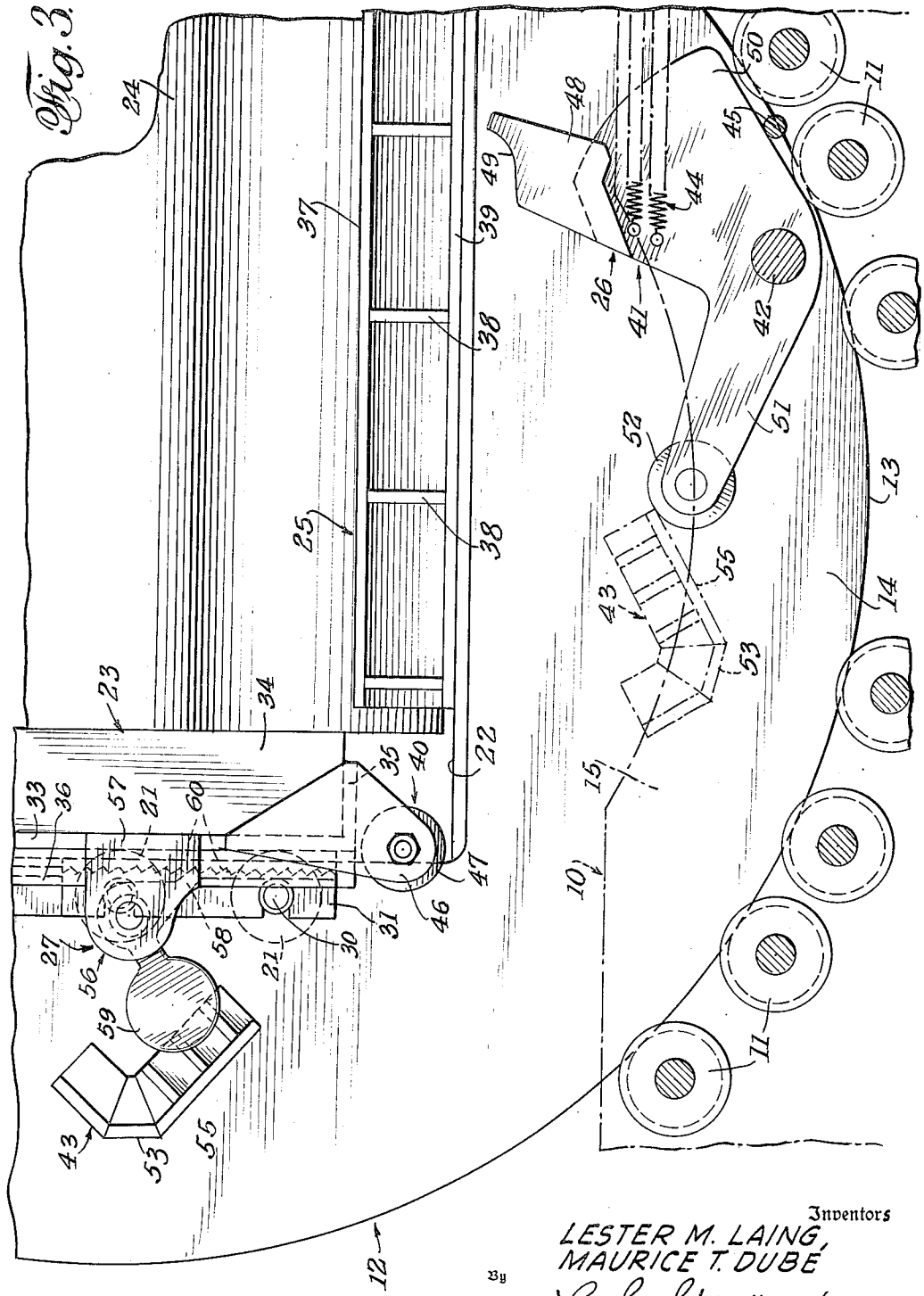
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Fig. 3.



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Fig. 3.

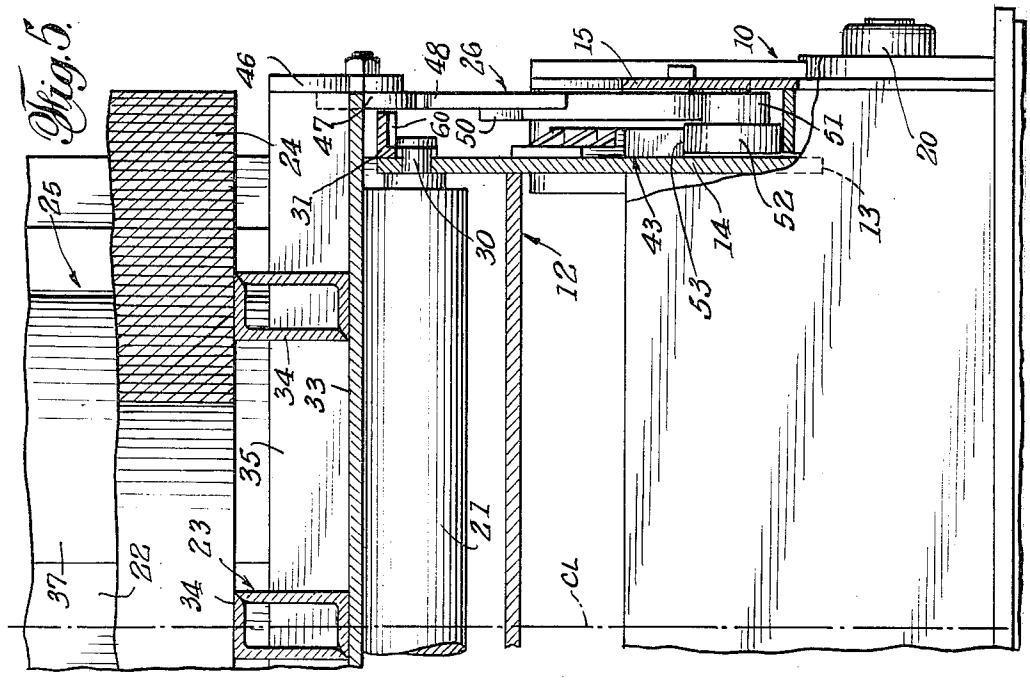
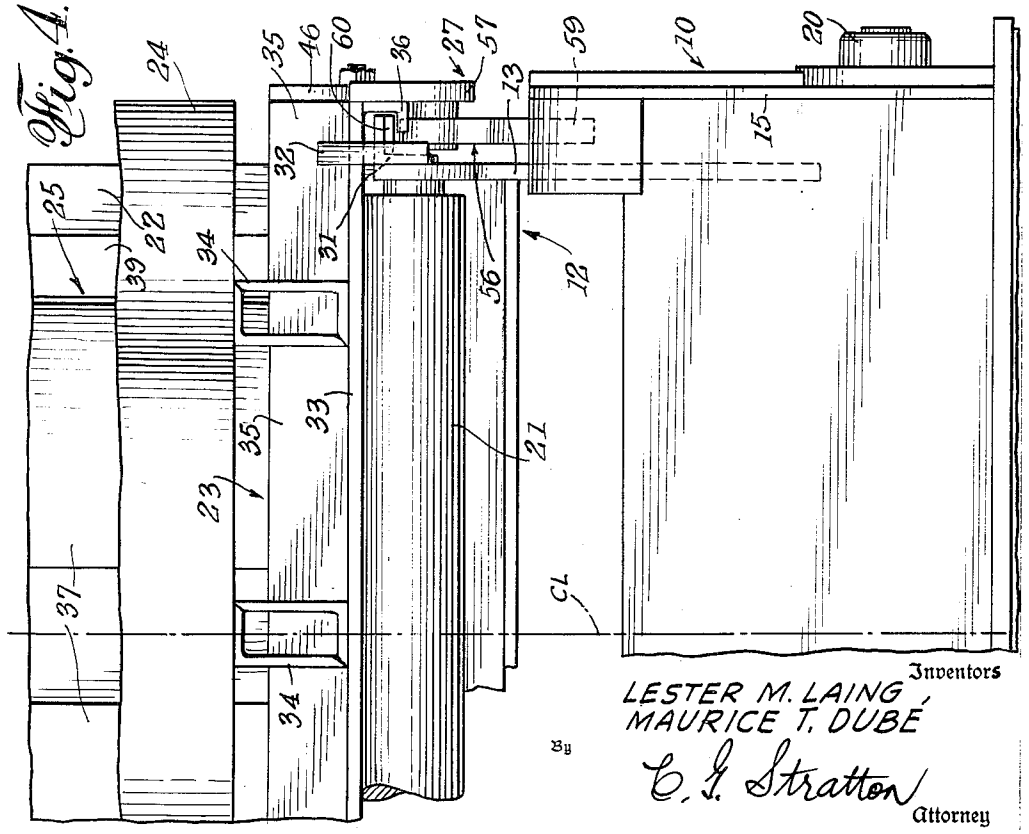


Fig. 4.



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3,206,049

TURNOVER CRADLE

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8 Claims. (Cl. 214—130)

This invention relates to a turnover cradle for changing the position of heavy articles, particularly heavy coils of strip steel and similar cylindrical articles.

An object of the invention is to provide a turnover cradle that will change such cylindrical articles from a flat position to a position supported on its cylindrical surface, or vice versa, in a smooth, non-jarring operation, thereby avoiding nicking of the edges or otherwise marring the same during such change of position. Such coils of strip stock are frequently forty-two or more inches wide and are made up at the strip mills in coils five feet or more in diameter weighing twenty-five or more tons. Even a small uncontrolled shift of such a weight when transferring the same from one support wall of a cradle to a support wall normal thereto to change the position of the coil, as above referred to, may result not only in the mentioned damage to the coil, if the same strikes the latter wall, but will damage said wall also and, perhaps, operating components of the machine.

Another object of the invention is to provide a turnover cradle that gently, and under full control, allows a coil of metal on one support wall of the cradle to shift into contact with the wall normal thereto, thereby achieving support contact with said wall upon the same reaching its turned-over position.

A further object of the invention is to provide a turnover cradle of the character above referred to that automatically locks carriage means on which the coil is supported before cradle turnover, after the coil has shifted to engage the wall of the cradle that is normal to the wall mounting the carriage, thereby preventing said carriage from striking said normal wall.

This invention also has for its objects to provide such means that are positive in operation, convenient in use, easily installed in a working position and easily disconnected therefrom, economical of manufacture, relatively simple, and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description and which is based on the accompanying drawings. However, said drawings merely show, and the following description merely describes, one embodiment of the present invention, which is given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

FIG. 1 is a partly broken side elevational view of a machine embodying a turnover cradle provided with the present improvements, the cradle being shown with its support wall in normal support position for receiving a heavy article on a carriage that constitutes said support wall.

FIG. 2 is a similar view with the near side wall of the machine removed and with the cradle in the process of being turned and with the carriage and load thereon partly shifted toward the load-receiving wall of the cradle under control of the present improvements.

FIG. 3 is a view similar to FIG. 2, showing the cradle in turned-over position with the load supported on the load-receiving wall of the cradle, and showing the manner of locking the carriage in spaced relation to the latter wall.

FIG. 4 is a broken front elevational view of approximately one-half of the machine, as in the position of FIG. 1, the line CL representing the center line between the right side of the machine, that is shown, and the left side, that is omitted since the same is the same but opposite to the right side.

FIG. 5 is a similarly broken sectional view, as taken on the line 5—5 of FIG. 1.

The present improvements are based on a machine having a base 10 in which is provided a plurality of support rollers 11 on each side for supporting a cradle 12 by engaging the arcuate edges 13 of the side walls 14 of said cradle. In this case, the rollers 11 are supported from the side walls 15 of the base 10, as on trunnions 16, by means of plates 17 pivoted on said trunnions, and link arms 18, that connect said rollers in pairs and are carried by said plates 17 on pivot pins 19. The foregoing, per se, forms no part of the present invention and is intended only to set a preferred environment and mode of support of the cradle 12 so the same may be rocked on the center of curvature of edge 13 through 90° of movement. The means for so rocking the cradle is not shown, the motor, at 20, representing such means, which also is well-known. In this connection, reference is made to Patent No. 3,035,715, dated May 22, 1962, the same, among other things, showing a 90° reversing drive for the cradle.

The present improvements comprise, generally, rotational means, such as a set of in-line rollers 21 spanning transversely between the side walls 14 of the cradle, a wall 22, also spanning between said cradle walls 14 and disposed normal to the plane common to said rollers, a carriage 23 mounted on said rollers and movable thereon toward and from said wall 22 of the cradle and constituting a movable support for a coil or coils 24 or other similarly shaped load, a coil-centering support 25 on the support wall 22, means 26 to control movement of the carriage 23 and its load 24 during rocking movement of the cradle from a position with the carriage horizontal to an angular position wherein the carriage will move on the rollers 21 in a direction toward the wall 22 of the cradle, and means 27, effective after the load 24 on the carriage has achieved gentle contact with said wall 22 and is in nesting or centering position with respect to the support 25 on said wall, to lock said carriage 23 against further movement toward the wall as the rocking movement of the cradle proceeds to the end of the 90° movement thereof.

Each of the rollers 21 is provided with end trunnions 30 that have bearing in the cradle walls 14, the same also extending through notches provided in guide angles 31 that are affixed to the outer faces of cradle walls 14 and form retaining guides for the carriage 23. At the front of the machine, a pair of transversely spaced bars 32 is affixed to the ends of said angles 31 to constitute a position-limiting stop for the carriage.

The wall 22 simply comprises a suitably thick metal sheet which may be reinforced as necessary to keep the safe flat under load.

The carriage 23 is shown as comprising a base wall 33 that rests upon the rollers 21, a plurality of longitudinal cleats 34 affixed to the top of said base wall and constituting the members upon which a load 24 is supported, a rear bar 35 preferably lower in height than the cleats 34, and retaining angles 36 affixed to the outer edges of the base wall 33 and extending downwardly into retention engagement with the guide angles 31, as best shown in FIG. 4. It will be clear that said carriage may move between the cradle wall 22 and the stop bars 32 but cannot be displaced in a direction away from the rollers except to a limited degree as permitted by the overlapped flanges of the angles 31 and 36 on each side of the machine.

Since the cleats 34 support a coil 24 in spaced relation to the base wall 33, it is a simple matter to deposit a coil on said cleats by means of the forks of a fork-lift truck or other overhead means. FIGS. 4 and 5 show the spaces provided between the cleats for accommodating the forks.

The support 25 on the wall 22 is here shown as a pair of similar but oppositely angled support walls 37, one on each side of the center line CL, each being braced by a plurality of brace walls 38 from a base wall 39 that is placed flat upon the wall 22. Said two walls 37 define a blunt and shallow V into which the cylindrical face of a coil may fit, as best shown in FIG. 3.

It will be understood that the carriage 23 may be provided with the V-support and the wall 22 with the cleats 34. In such case, the coil 24 would be deposited on the carriage standing on its cylindrical side. It will be clear that the present means operates in exactly the same way, whether turning a coil from a flat position to an on-end position or vice versa. In the latter case, the cleats on wall 22 may be replaced by a pallet. In either case, the forks of a fork-lift truck may be used to lift the repositioned load.

The means 26 comprises, generally, a pair of roller means 40 at each rearward corner of the carriage, a control lever 41 on a trunnion 42 mounted on the inner side of each side wall 15 of the base 10, a fixed cam 43 on the outer face of each side wall 14 of the cradle 12, and a spring bias 44 to resiliently retract the control lever against a stop pin 45.

Each roller means 40 is shown as a bracket 46 on the side of the carriage laterally outward from the cradle wall 14, as clearly seen in FIG. 5, and a roller 47 on each bracket 46, the axes of the rollers being aligned and parallel to the axes of the rollers 21. It will be clear that said rollers 47 are laterally spaced from the cradle sides.

Each control lever 41 is provided with an arm 48 with a seat 49 in the end thereof into which the roller 47, on that side nests, as may be seen in FIG. 1. Said lever arm 48 is provided with a weighted portion 50 that insures retraction of the lever 41 in the event of failure of the spring bias 44, or the bias may be omitted, if desired. A cam arm 51 extends substantially normal to the arm 48 of each lever 41 and in a forward direction, a cam roller or follower 52 being provided on the end of arm 51.

The cam 43 comprises a slightly relieved face 53 engaged by the roller 52 and which may be arcuate on the center of rocking of the cradle, said face 53 being so located on the cradle that the same, for its entire length, holds roller 52 and, therefore, the lever 41 stationary as rocking movement of the cradle is instituted in the direction indicated by the arrow 54 of FIG. 2. Thus, during the first three to five degrees of rocking movement of the cradle, the seat 49 of the control lever does not move, allowing the carriage 23 to settle thereagainst. As the cradle continues its movement, the end of cam 53 moves past the roller which now engages a cam face 55 of said cam 43. The latter face is designed to allow the cam arm 51 to slowly retract so the carriage 23 may follow the same. As can be seen from FIG. 2, the angle at which the carriage is disposed increases and the same, with the load thereof, being gravitationally biased against the lever arms 41, moves down on rollers 21 toward the support wall 22 and the support means 25 thereon.

A heavy load 24 on the carriage, due to the friction thereof with the cleats 34, will have no tendency to shift relative to the carriage until an angle approximating 18° of the carriage relative to the horizontal is reached. This angle may vary according to the coefficient of friction. However, since the rollers 21 may be mounted in anti-friction bearings, the same, even when heavily weighted, will roll, after the initial inertia to rotation is overcome. Since such inertia is overcome within the

first 5° of movement of the cradle, the cam face 55 is designed to retain contact with the roller 52 until after the carriage has moved from its fully retracted position against the stop bars 32 to a position where the coil achieves contact with the support means 25 on the cradle wall 22. So that such contact of coil and support may be had, the coil is placed on the carriage with its rear portion overhanging the rear of the carriage, as in FIGS. 1 and 2.

At any time after the coil has been so gently brought into contact with the support means 25, the cam roller 52 may lose engagement with the cam face 55, as the turning movement of the cradle continues.

The locking means 27, on each side of the machine, comprises a gravity pawl 56 pivotally mounted on a bracket 57, affixed to the side of carriage 23, and provided with a dog point 58. Said pawl has a weighted portion 59 that, when hanging pendent, holds the point 58 of the pawl in a horizontal, rearwardly directed position, as shown in both FIGS. 1 and 2. Said locking means 27 further includes a set of ratchet teeth 60 provided on the under face of one of the guide angles 31 and vertically aligned with the pawl, as may be seen in FIG. 4.

With the cradle in the normal starting position of FIG. 1, the pawl point 58 is considerably spaced from said ratchet teeth and, as the cradle rocks, as described, gravity holds the weighted portion 59 of the pawl pendent and the pawl points horizontal, thus bringing the ratchet teeth 60 nearer to said point, as in FIG. 2. From the latter figure, it will be clear that continued movement of the cradle in the direction of the arrow 54 will cause the ratchet teeth to catch up to the pawl point which will engage one of said teeth to prevent the carriage 23 from continuing the movement that brought the coil into position on the support 25. This locking of the carriage to the cradle occurs long before the latter reaches the full turnover position of FIG. 3, but is retained not only when the cradle reaches the latter position but even after the cradle is returned to about the position of FIG. 2.

It will be realized that the weight of the carriage, when the pawl locks the same, will cause the dog point 58 to wedge tightly against the tooth with which it is engaged. As a consequence, the pawl 56 will remain in its locking position, as in FIG. 3, so long as the weight of the carriage is effective to place a load on said point. The lock is released only after the control lever 41 is re-rocked from the fully retracted position against the stop 45 to which the spring bias 44 moved said lever. The full-line position of FIG. 3 shows lever 41 in such fully retracted position, wherein the cam roller 52 is disposed in the path of return movement of the cam face 55 so said face and the face 53 of the cam re-rock lever 41 back to its original operating position shown in FIG. 1. In so doing, the arm 48 of lever 41 moves into pushing engagement with the roller means, thereby pushing the carriage 23 toward the stop bars 32 and releasing the pawl 56 from its wedged engagement with the ratchet tooth 60. The pawl now falls gravitationally to a pendent position and, when the cradle stops its return movement as limited by the engagement of the stop brackets 61 with the base walls 15, the carriage is in the position of FIG. 1 and ready to receive another coil 24. It will be understood that stops similar to stop brackets 61 are provided to limit the position of the cradle, as in FIG. 3.

While the foregoing has illustrated and described what is now contemplated to be the best mode of carrying out the invention, the construction is, of course, subject to modification without departing from the spirit and scope of the invention. Therefore, it is not desired to restrict the invention to the particular form of construction illustrated and described, but to cover all modifications that may fall within the scope of the appended claims.

Having thus described this invention, what is claimed and desired to be secured by Letters Patent is:

1. A turnover cradle comprising
(a) a support wall,
(b) rotational means arranged in a common plane that is normal to said wall,
(c) a support carriage on and movable on said rotational means toward and from the mentioned support wall,
(d) means to control the movement of the carriage and an article thereon in the direction toward the support wall to ease the force of contact of the article with said wall during transfer of said article from the carriage to the wall during a 90°-turnover movement of the cradle, and
(e) means to lock the carriage to the cradle after the article has made contact with the support wall and before the carriage has engaged said wall.

2. A turnover cradle according to claim 1 in which the latter means comprises a set of ratchet teeth fixedly provided on the cradle and a gravity pawl carried by the carriage and provided with a dog point that engages one of said ratchet teeth when the cradle has been turned to an angle that brings said tooth into locking contact with the dog point as the pawl hangs gravitationally pendent.

3. A turnover cradle comprising
(a) a support wall,
(b) rotational means arranged in a common plane that is normal to said wall,
(c) a support carriage on and movable on said rotational means toward and from the mentioned support wall,
(d) means to control the movement of the carriage and an article thereon in the direction toward the support wall to ease the force of contact of the article with said wall during transfer of said article from the carriage to the wall during a 90°-turnover movement of the cradle.
(e) a locking lever pivotally carried by the cradle, said lever having one arm disposed in movement-limiting engagement with the carriage, and a second arm provided with a cam follower, and
(f) a cam affixed to the cradle and engaged with the cam follower to control retractive rocking movement of the lever and said movement-limiting arm during a 90°-turnover movement of the cradle to effect controlled contact of an article on said carriage with the support wall.

4. A turnover cradle comprising
(a) a support wall,
(b) rotational means arranged in a common plane that is normal to said wall,
(c) a support carriage on and movable on said rotational means toward and from the mentioned support wall,
(d) means to control the movement of the carriage and an article thereon in the direction toward the support wall to ease the force of contact of the article with said wall during transfer of said article from the carriage to the wall during a 90°-turnover movement of the cradle,

(e) a locking lever pivotally carried by the cradle, said lever having one arm disposed in movement-limiting engagement with the carriage, and a second arm provided with a cam follower,
(f) a cam affixed to the cradle and engaged with the cam follower to control retractive rocking movement of the lever and said movement-limiting arm during a 90°-turnover movement of the cradle to effect controlled contact of an article on said carriage with the support wall, and
(g) means to lock the carriage to the cradle after the article has made contact with the support wall and before the carriage has engaged said wall.

5. A turnover cradle according to claim 3 provided with a retraction-limiting stop for said control lever to leave the cam follower thereof in the path of return movement of the cam upon reverse turnover movement of the cradle, said cam thereby moving said lever to effect re-engagement with the carriage of said one arm of the lever.

6. A turnover cradle according to claim 4 provided with a retraction-limiting stop for said control lever to leave the cam follower thereof in the path of return movement of the cam upon reverse turnover movement of the cradle, said cam thereby moving said lever to effect re-engagement with the carriage of said one arm of the lever, said re-engagement of the control lever and carriage releasing the gravity pawl to unlock the carriage from the cradle.

7. A turnover cradle according to claim 3 provided with a retraction-limiting stop for said control lever to leave the cam follower thereof in the path of return movement of the cam upon reverse turnover movement of the cradle, said cam, as the same nears its original position, moving said lever back toward the position thereof in which the mentioned one lever arm is in its original movement-limiting position to thereby effect re-engagement with the carriage of the latter lever arm when the cradle reaches its original position.

8. A turnover cradle according to claim 4 provided with a retraction-limiting stop for said control lever to leave the cam follower thereof in the path of return movement of the cam upon reverse turnover movement of the cradle, said cam, as the same nears its original position, moving said lever back toward the position thereof in which the mentioned one lever arm is in its original movement-limiting position to thereby effect re-engagement with the carriage of the latter lever arm when the cradle reaches its original position, said re-engagement of the control lever and carriage releasing the gravity pawl to unlock the carriage from the cradle.

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