March 31, 1942. M. P. SIEGER 2,278,140

PACK HANDLING APPARATUS

Filed Aug. 24, 1939 3 Sheets-Sheet 1

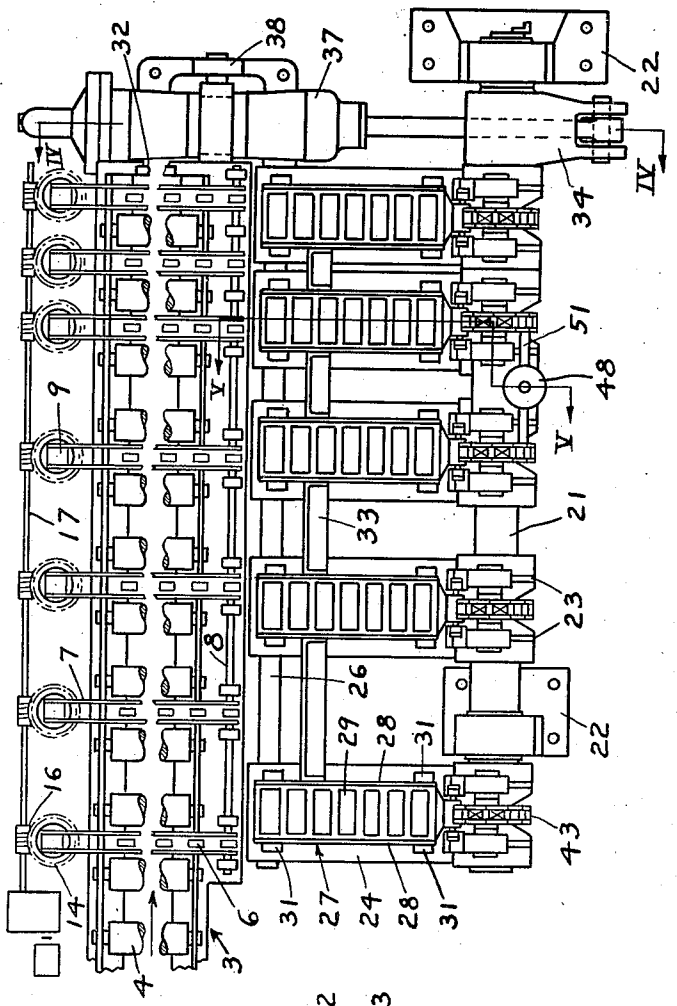


FIG. 1

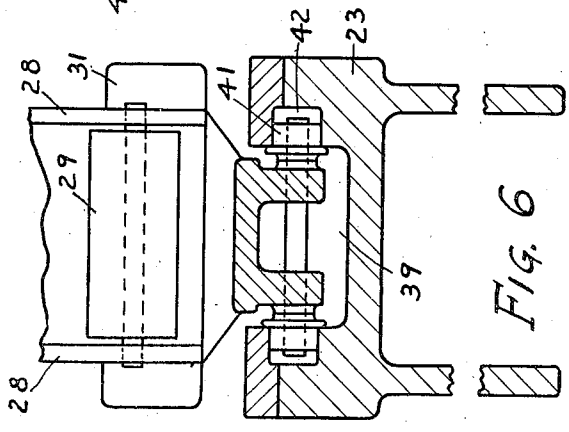


FIG. 6

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PACK HANDLING APPARATUS

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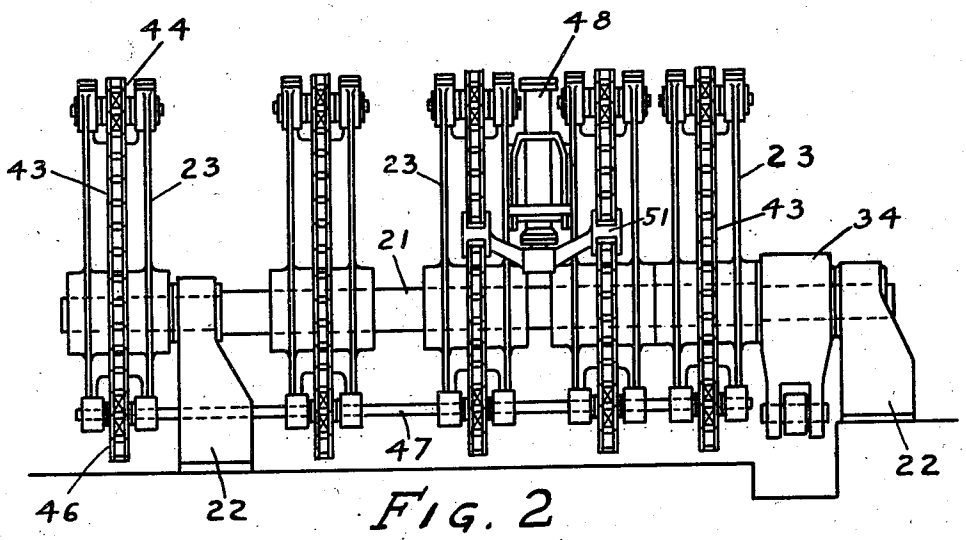


FIG. 2

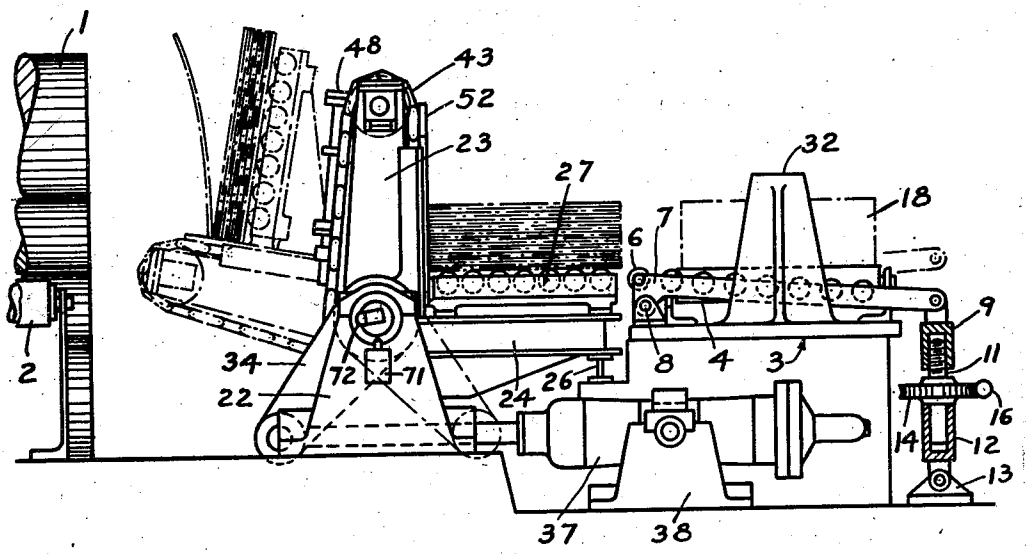


FIG. 3

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PACK HANDLING APPARATUS

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FIG. 4

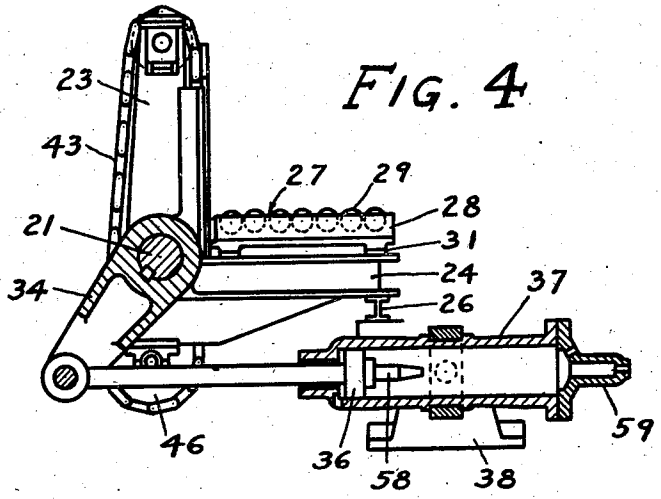
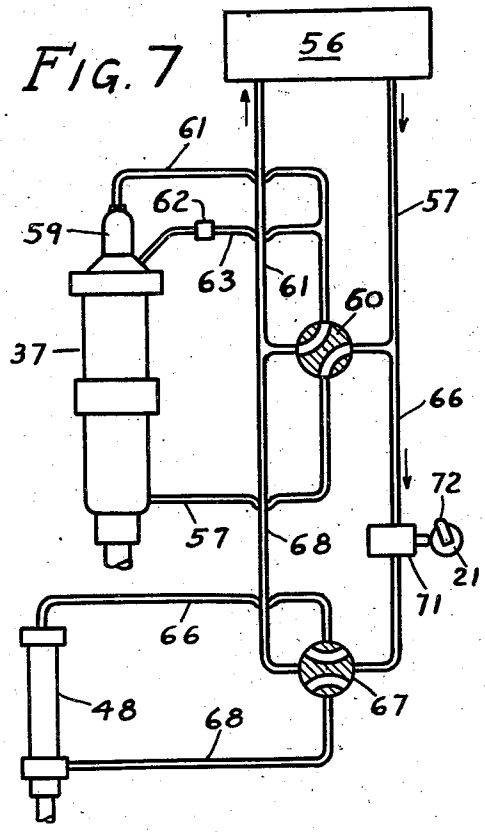



FIG. 7



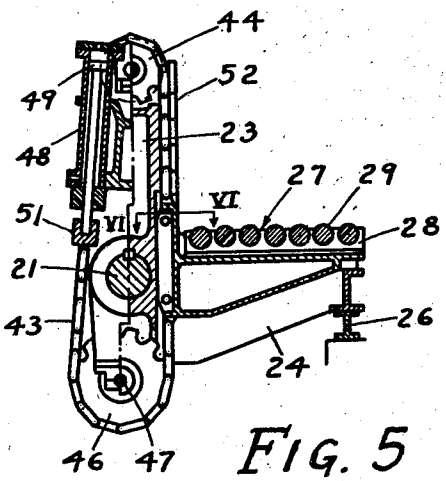




FIG. 5

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# UNITED STATES PATENT OFFICE

2,278,140

## PACK HANDLING APPARATUS

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Application August 24, 1939, Serial No. 291,715

11 Claims. (Cl. 214—8.5)

This invention relates to a method and apparatus for handling packs of metal sheet, and more particularly to apparatus for delivering such packs to a position from which the sheets may be fed individually to a rolling mill or the like.

It is common practice in the manufacture of sheet-like material to roll steel in strip form to the width and gauge desired, cut it into lengths or sheets, stack the sheets and anneal them, and then deliver the sheets to a rolling mill for a skin or temper pass. The sheets are fed one at a time to the mill and are generally manipulated by hand, but frequently they are of such large size that they are cumbersome and exceedingly heavy to handle. The capacity of the mill used is generally limited by the ability of the workmen to supply it with sheets. To overcome these difficulties it has been proposed to convey packs or stacks of sheets to a point adjacent the feed table of a rolling mill and then tilt them on edge so that each individual sheet need be merely turned or flopped over onto the feed table. However, such pack handling apparatus is rather limited in the thickness of the pack that it can handle. This is because a thick pack will be too close to the feed table when tilted toward it, or if the tilting apparatus is spaced farther from the table to take care of this situation thin packs or thick packs that have been partly reduced will be too far from the table.

It is among the objects of this invention to provide a pack tilting method and apparatus with which tilted packs of sheets are adjustable toward and away from a feed table or the like so that they may be maintained a predetermined distance from the table.

In accordance with this invention a carriage is disposed at the side of a rolling mill feed table or the like in position for receiving a pack of metal sheets. This carriage is adapted to be tilted by suitable means toward the feed table to stand the pack of sheets on edge adjacent that table. The tilted carriage is originally far enough from the table to accommodate thick packs, and is so mounted as to be movable toward the table as the thickness of the tilted pack is diminished by the removal of sheets from it to the table. Preferably, the packs are delivered to the carriage from a conveyor provided with spaced conveyor rollers having rows of ejector rollers disposed between and normally below them at right angles thereto. When the outer ends of these rows of ejector rollers are raised, a pack of sheets resting on the conveyor rollers is lifted therefrom and rolls off the side of the conveyor onto the carriage.

The preferred embodiment of the invention is illustrated in the accompanying drawings in which Fig. 1 is a plan view of my apparatus beside the feed table of a rolling mill; Fig. 2 is a side view of the tilting apparatus taken from the feed table side; Fig. 3 is an end view of the entire apparatus taken from the outer end of the feed table; Fig. 4 is a vertical section through the tilting mechanism taken on the line IV—IV of Fig. 1; Fig. 5 is a vertical section through a carriage and its adjusting means taken on the line V—V of Fig. 1; Fig. 6 is an enlarged horizontal section taken on the line VI—VI of Fig. 5; and Fig. 7 is a diagrammatic view of the fluid pressure circuit used to tilt and adjust the carriage.

Referring to Figs. 1 and 3 of the drawings, in front of a conventional rolling mill 1, shown diagrammatically, is a feed table 2 for delivering metal sheets to the mill. Spaced from one side of this table is a conveyor 3 comprising a plurality of laterally spaced rollers 4 that may be or may not be driven, as desired. Disposed between and normally below the tops of at least some of the rollers are rows of short ejector rollers 6 disposed substantially at right angles to the conveyor rollers. Each row of ejector rollers is journaled in a bifurcated arm 7 extending transversely of the conveyor and pivoted on a horizontal shaft 8 extending along the conveyor on the feed table side. The opposite or outer end of each arm is pivotally connected to the upper end of an internally threaded sleeve 9 in which the threaded upper portion of a vertical shaft 11 is mounted. The unthreaded lower portion of this shaft is journaled in the upper end of sleeve 12, the lower end of which is pivotally connected to a supporting bracket 13. The short vertical shaft 11 is rotated by means of a worm gear 14 keyed on its central portion and turned by a worm 16 which is driven by a shaft 17 extending lengthwise of the conveyor. When shafts 11 are rotated in the proper direction their threaded upper ends raise the outer ends of the arms 7 connected to them, and the ejector rollers 6 carried by the arms lift a pack 18 of sheets off the conveyor rollers whereupon it rolls by gravity from the conveyor toward the feed table.

Mounted between the conveyor and feed table for receiving packs of sheets from the former and for transferring them to the desired position be-

side the latter is pack-tilting apparatus that forms one of the features of this invention. Accordingly, a shaft 21 that is parallel to the conveyor and feed table is shown journaled in pedestal bearings 22 disposed about halfway between the conveyor and table. Keyed on this shaft at suitable intervals are upright channel-like frames 23 that extend farther above the shaft than below it and have integral rectangular side frames 24 projecting toward the conveyor 3 where they rest on a horizontal beam 26. Connected to the conveyor side of each upright frame in a manner presently to be described is a horizontal carriage 27 that extends to a point close to the conveyor 3 and which is adapted to receive a pack of sheets as it rolls off the ejector rollers 6. Each carriage comprises a pair of spaced parallel side members 28 in which a plurality of rollers 29 are journaled. The side members are provided with lateral projections 31 that rest on side frames 24.

Packs of sheets are carried by the conveyor rollers 4 to the end of the conveyor where they are stopped by an upwardly projecting stop 32. As short packs require more closely spaced points of support than long packs, carriages 27 are spaced apart accordingly. That is, the two carriages nearest the stop end of the conveyor are closer together than the others, all of the carriages being rigidly connected in spaced relation by means of spacing bars 33 secured to their sides as shown in Fig. 1.

A pack of sheets that has rolled from the ejector rollers 6 of the conveyor and onto the rollers 29 of the carriages is then moved to a position adjacent the feed table by tilting the carriages in that direction, as shown by the broken lines in Fig. 3. The tilting is done by means of a lever 34 projecting from one end of the shaft 21 and pivotally connected to a piston 36 (Fig. 4) disposed in a fluid pressure cylinder 37 that is rockably mounted between pedestal bearings 38.

As it is a feature of the invention that the carriages, after being tilted, may be moved toward the feed table so as to always keep a pack of sheets the desired distance therefrom, the inner end of each carriage projects into a vertical recess 39 (Fig. 6) in the side of the upright frame 23 and carries two pairs of lateral rollers 41 (Figs. 5 and 6) that travel in vertical guideways 42 in order to permit the carriage to be moved longitudinally of the frame. For moving the carriage in this manner its inner end is connected to an endless chain 43 that passes around sprockets 44 and 46 journaled in the ends of the frame 23. The lower sprockets 46 are all keyed on the same shaft 47 so that all chains can be driven by the same actuating means. This means comprises a fluid pressure cylinder 48 rigidly mounted between two upright frames 23 (Fig. 2) and containing a piston 49 (Fig. 5) connected by a yoke 51 to the adjacent pair of chains. When the yoke is pushed away from the cylinder by fluid pressure therein the chains pull the carriages 27 toward the feed table 2. The chain links adjacent the top side of the carriages are provided with flat cross pieces 52 that form a solid support for the pack of sheets when it is tilted on edge.

The fluid pressure circuit by which the carriage tilting and adjusting cylinders are energized will now be described. Referring to Fig. 7, a pump 56 forces fluid under pressure through a pipe 57 into one end of the carriage tilting cylinder 37, when the valve 60 is open, to move the piston 36 to the right in Fig. 4 and thereby tilt the carriages toward the feed table. To prevent the weight of the pack of sheets from swinging frames 23 down toward the table with excessive force, a dash-pot effect is created in the tilting cylinder. That is, as the piston approaches the end of its stroke a plunger 58 with which it is provided enters a small barrel 59 on the end of the cylinder. This substantially closes the outlet through a pipe 61 and the valve 60 to the pump, but the pressure that then builds up in the cylinder and retards the movement of the piston opens a pressure relief valve 62 in another outlet pipe 63 leading from the end of the cylinder to the outlet pipe 61. When it is desired to swing the carriage back to its original horizontal position, the valve is turned so as to admit fluid under pressure into the right end of the cylinder (Fig. 4) and exhaust it from the opposite end.

The same pump also furnishes the fluid under pressure for the carriage adjusting cylinder 48. Thus, the pipe 57 is connected by a pipe 66 and a valve 67 to the upper end of the cylinder, and the lower end is connected by a pipe 68 and the valve 67 to the pipe 61. When pressure is applied to the top of the piston 49 the carriages are moved on frames 23 toward the feed table, and when the pressure is reversed the carriages are returned to their original position. To prevent damage that may result from the operator attempting to move the loaded carriages on their supporting frames before they have been tilted, the fluid pressure circuit for the cylinder 48 can be completed only after tilting. This is because a spring biased valve 71 in the pipe 66 is closed except when opened by a lug 72 carried by the end of the shaft 21 and which engages the valve to open it only when the shaft has been turned to carriage tilting position.

It will be understood that with pack handling apparatus constructed in accordance with this invention the top sheet of the pack may always be kept at the most desirable distance from the feed table, regardless of the original thickness of the pack and its decreasing thickness caused by feeding the sheets one by one to the table. As indicated above, this is done by manipulating valve 67 whenever it is desired to move the pack closer to the table so as to eliminate unnecessary work in transferring the sheets from carriage to feed table. The conveyor is also designed to facilitate transfer of packs to the carriages, but it will be understood that the conveyor rolls could be placed between the carriages so that packs could be fed longitudinally onto the carriages instead of laterally thereto.

According to the provisions of the patent statutes, I have explained the principle and construction of my invention and have illustrated and described what I now consider to represent its best embodiments. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. Pack handling apparatus for use with a feed table or the like, comprising a carriage adapted to normally support a pack of metal sheets in a horizontal plane, movable means for engaging one edge of the pack when located on the carriage, means for swinging the carriage upwardly toward and adjacent to said table to tilt the pack on edge against said movable edge-engag-

ing means at an angle to the vertical, and means for moving the carriage and said pack-engaging means to carry the tilted pack toward the table as the sheets are individually removed therefrom whereby to keep the pack close to the table.

2. Pack handling apparatus for use with a feed table or the like, comprising a carriage adapted to normally support a pack of metal sheets in a substantially horizontal position, movable means for engaging one edge of the pack when located in the carriage, means for tilting the carriage toward and adjacent to said table to stand the pack on edge against said movable pack edge-engaging means at an angle to the vertical, and means for moving the tilted carriage and said movable pack edge-engaging means toward the table as the sheets are removed individually therefrom whereby to keep the pack close to the table.

3. Pack handling apparatus for use with the feed table or the like, comprising a plurality of spaced conveyor rollers for conveying a pack of metal sheets, a row of ejector rollers disposed between and normally below adjacent conveyor rollers at right angles thereto, means for raising one end of said row of rollers to lift a pack of sheets and cause it to roll therefrom, a carriage mounted adjacent the ends of the conveyor rollers for receiving said pack, movable means for engaging one edge of a pack positioned on said carriage, means for tilting the carriage and movable edge-engaging means toward and adjacent to said table to tilt the pack on edge at an angle to the vertical, and means for moving the carriage and pack edge-engaging means to carry the tilted pack toward the table as the sheets are individually removed therefrom whereby to keep the pack close to the table.

4. Pack handling apparatus for use with the feed table or the like, comprising a plurality of spaced conveyor rollers for conveying a pack of metal sheets, an arm disposed between and normally below adjacent conveyor rollers, a plurality of ejector rollers journaled in said arm at right angles to the conveyor rollers, means for raising one end of said arm to lift a pack of sheets from the conveyor rollers and cause it to roll from the opposite end of the arm, a carriage mounted adjacent said opposite end of the arm for receiving said pack, movable means for engaging the edge of the pack positioned on said carriage, means for tilting the carriage and said movable pack edge-engaging means toward and adjacent to said table to tilt the pack on edge at an angle to the vertical, and means for moving said carriage and movable pack edge-engaging means to carry the tilted pack toward the table as the sheets are individually removed therefrom whereby to keep the pack close to the table.

5. Pack handling apparatus for use with a feed table or the like, comprising a plurality of spaced conveyor rollers for conveying a pack of metal sheets, an arm disposed between and normally below adjacent conveyor rollers, a plurality of ejector rollers journaled in said arm at right angles to the conveyor rollers, a screw actuated means for raising one end of said arm to cause a pack of sheets to roll from its opposite end, a carriage mounted adjacent said opposite end of the arm for receiving said pack, movable means for engaging the edge of a pack positioned on said carriage, means for moving the carriage and said movable pack edge-engaging means toward and adjacent to said table to tilt the pack on edge at an angle to the vertical, and means for moving the carriage and the movable pack edge-engaging means to carry the tilted pack toward the table as the sheets are individually removed therefrom whereby to keep the pack close to the table.

6. Pack handling apparatus for use with a feed table or the like, comprising an upright frame, a carriage movably mounted thereon and adapted to support a pack of metal sheets in a substantially horizontal position, means for swinging said frame in a vertical plane toward said table to cause said carriage to tilt said pack on edge at an angle to the vertical and adjacent to the table, and means for engaging and supporting the edge of a pack when tilted thereagainst and for moving the tilted carriage on said frame toward the table as the sheets are removed therefrom whereby to keep the pack close to the table.

7. Pack handling apparatus for use with a feed table or the like, comprising an upright frame, a carriage movably mounted thereon and adapted to support a pack of metal sheets in substantially horizontal position, means for swinging said frame in a vertical plane toward said table to cause said carriage to tilt said pack on edge at an angle to the vertical and adjacent to the table, means mounted for movement on the upright frame and adapted to support a pack on its edge when tilted thereagainst and for moving the tilted carriage on said frame toward the table as the sheets are removed therefrom whereby to keep the pack close to the table, and fluid pressure operated means for actuating said carriage and pack-edge engaging means in opposite directions.

8. Pack handling apparatus for use with a feed table or the like, comprising an upright frame, means pivotally mounting the lower portion of the frame on a horizontal axis substantially parallel to the table, means for swinging the upper end of said frame down toward the table at an angle to the vertical, a carriage mounted on the frame and adapted to support a pack of metal sheets, means for engaging the edge of a pack positioned on the carriage and for moving the carriage toward said upper end of the frame when it is in its lowered position.

9. Pack handling apparatus for use with a feed table or the like, comprising an upright frame, a carriage movably mounted thereon and adapted to support a pack of metal sheets in substantially horizontal position, means for swinging said frame in a vertical plane toward said table to cause said carriage to tilt said pack on edge adjacent the table, fluid pressure operated means for moving the tilted carriage on said frame toward the table as the sheets are removed therefrom whereby to keep the pack close to the table, and a valve controlling said fluid pressure opened only when said frame has been swung toward the table.

10. Pack handling apparatus for use with a feed table or the like, comprising an upright frame, means pivotally mounting the lower portion of the frame on a horizontal axis substantially parallel to the table, means for swinging the upper end of said frame down toward the table, sprockets journaled in the upper and lower ends of the frame, a chain carried by said sprockets, a fluid pressure cylinder mounted on said frame, a piston in said cylinder and connected to the chain for moving it around the sprockets, and a carriage movably mounted on the frame and adapted to receive a pack of metal

sheets, said chain being connected to the carriage for moving it.

11. Pack handling apparatus for use with a feed table or the like, comprising a plurality of parallel upright frame members, a carriage movably mounted thereon and adapted to support a pack of metal sheets in substantially horizontal position, means comprising a hydraulic motor and crank mechanism for swinging said frame members in a vertical plane toward said table to cause said carriage to tilt said pack on edge at an angle to the vertical adjacent the table, fluid pressure operated means for moving the tilted carriage on said frame members toward the table as the sheets are removed therefrom whereby to keep the pack close to the table, and a valve controlling said fluid pressure opened only when said frame has been swung toward the table.

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