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[54] **SHEET SQUARING APPARATUS**

[75] Inventor: **James Edward Dooley,** Bridlington, England

[73] Assignee: **T. Dooley & Co. Limited,** Durham, England

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[51] **Int. Cl.** **B65h 31/40**

[58] **Field of Search** ..... 271/89, 210, 213; 214/6 S, 214/8.5 A; 34/150, 164

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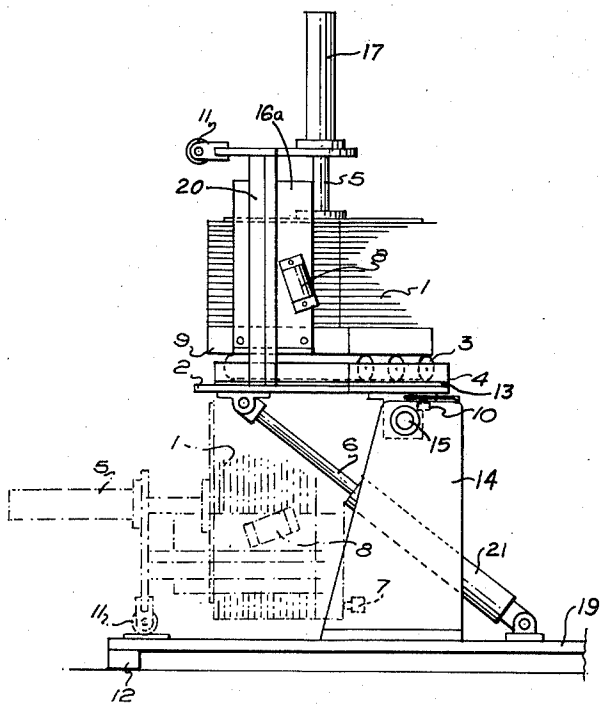
Primary Examiner—Evon C. Blunk

Assistant Examiner—Bruce H. Stoner, Jr.

[57] **ABSTRACT**

A sheet squaring apparatus comprising a carrier having a base and two sides, the sides being perpendicular or substantially perpendicular to the base and one side being disposed with respect to the other at an angle corresponding to the angle between corresponding edges of sheets to be squared, a support rotatably mounting the carrier for movement between a receiving position in which the base may carry the lowermost sheet of a stock of sheet and an operative position in which the sides may carry adjacent sides of the stack, a holder located adjacent the sides and spaced from the base for holding sheets in the carrier during rotation from the receiving position and in the operative position and a vibrator for shaking the carrier and thus the sheets.

4 Claims, 2 Drawing Figures



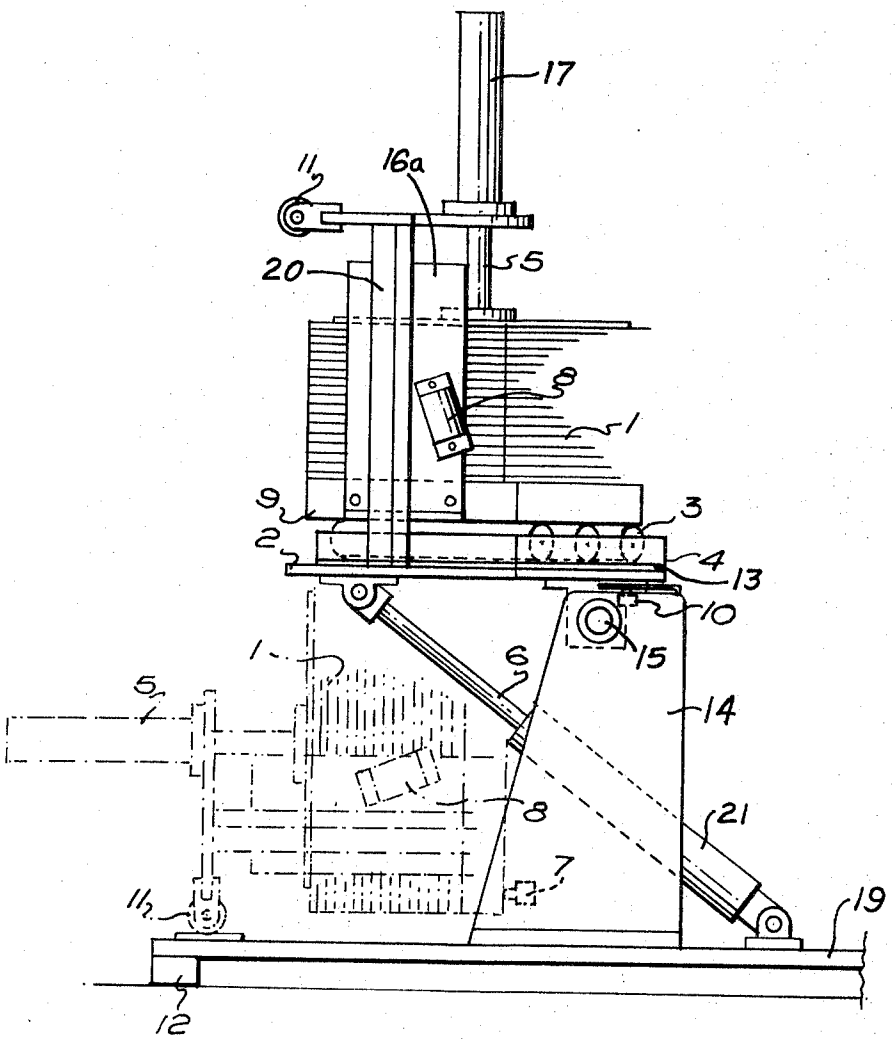


FIG. 1

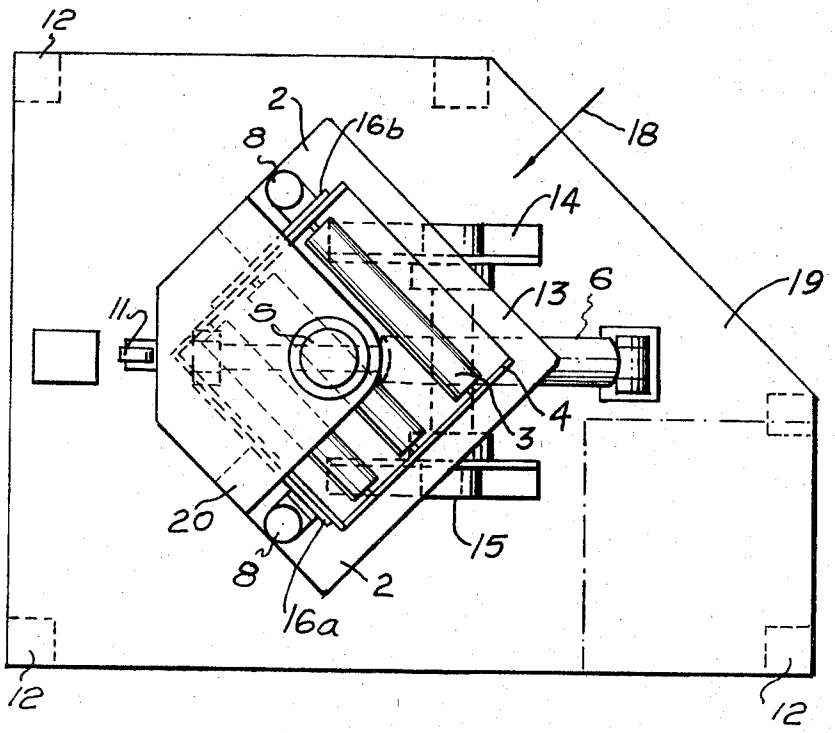


FIG. 2

SHEET SQUARING APPARATUS

This invention relates to sheet squaring apparatus.

When sheets of tin plate are manufactured the sheets are piled one on top of another into a stack which may contain from one to three tons of sheets each of which may have a thickness as little as two to fifteen or up to thirty thousandths of an inch or as much as a quarter to half an inch. The sides of the stack are ragged and in order to produce an orderly stack the sheets are manually lifted one at a time into a frame in which a stack with squared sides is built. In a good day a man may deal in this way with two tons of sheets. The squared stacks are then loaded for transport and during transit the sheets commonly become dislodged from their positions and require re-stacking upon delivery. In the production of tin plate a considerable amount of scrap sheets arise — a mill may have ten thousand tons of such scrap for disposal each week — and this is dealt with by merchants who commonly employ a labour force of some two hundred men about half of whom are engaged in the manual squaring up of stacks of sheets.

An object of the invention is to provide mechanical means for the squaring of sheets in a stack.

According to the invention sheet squaring apparatus comprises a carrier having a base and two sides, the sides being perpendicular or substantially perpendicular to the base and one side being disposed with respect to the other at an angle corresponding to the angle between corresponding edges of sheets to be squared, a support rotatibly mounting the carrier for movement between a receiving position in which the base may carry the lowermost sheet of a stack of sheets and an operative position in which the sides may carry adjacent sides of the stack, a holder located adjacent the sides and spaced from the base for holding sheets in the carrier during rotation from the receiving position and in the operative position and a vibrator for shaking the carrier and thus the sheets.

The holder may be carried on at least one of the sides of the carrier for rotation therewith and may be movable, for example by the provision of an hydraulic or pneumatic ram between the holder and the side(s), in the direction of the base for releasable clamping a stack of sheets to the base.

The sides of the carrier are generally mutually disposed at an angle corresponding to the angle between adjacent edges of the sheets to be squared and usually perpendicularly for use with rectangular sheets; however, more than two sides, may be provided for use with sheets adjacent edges of which meet at an obtuse angle provided always that the carrier is open sided for the insertion and withdrawal of a stack of sheets.

The support may comprise two pedestals, to which the carrier may be rotatably connected for example by a shaft connected to the base and the pedestals may be mounted on a bottom member. The shaft may be cranked for counterbalancing the carrier.

The vibrator may be mounted on a side of the carrier and in the case of a reciprocatory vibrator its axis of rotation may be normal to the side. Two or more vibrators may be provided for example one on each side of the carrier.

Tipping means may be connected to the carrier and this should be power operable in the usual case where the carrier when loaded will be too heavy for manual

tipping from the operative to the receiving position and vice versa. An hydraulic ram may be mounted between the bottom member and the carrier, for example the base of the carrier, at a point removed from its axis of rotation.

Conveyor means for positioning a stack of sheets may be provided on the base of the carrier, for example conveyor rolls may be rotatably mounted thereon for facilitating the introduction of a stack of sheets over the base up to the sides of the carrier. The conveyor rolls may be mutually parallel and their axis may be parallel to the axis of rotation of the carrier, a central line normal to which usually bisects the angle between the sides, or the outermost sides of the carrier.

In use of the apparatus preferred for squaring stacks of tin plate a stack of sheets is moved over the base of the carrier when in the receiving position in which it may be retained by a stop; for example, the base may engage a support frame for conveyor rolls leading to the conveyor rolls on the base. The holder is then brought down onto the stack, for example by a screw attachment or hydraulic ram, and the carrier is tilted through 90° so that the sides are lowered from a vertical position to the operative position in which the base is vertical. A stop may be provided e.g. on the bottom member for engagement with the carrier, and, preferably, with the base in the operative position, the stop may abut the underside of the vertically positioned base. The commencement of vibration of the sheets should be gradual and this may be achieved by switching on the vibrators followed by withdrawing the holder for releasing its clamping action sufficiently slowly to avoid undue jolting of the sheets, which could otherwise result in sheets being thrown out of the carrier. As the sheets vibrate air gaps are introduced between them, and their lower edges settle down to the sides of the carrier. When the stack is squared the vibrators are switched off, the carrier returned to the receiving position and the stack removed.

The stack may be loaded onto the base or the conveyor rolls leading to it, and removed after squaring of the stack by a fork lift truck.

A stack of sheets of mixed sizes may be squared and this enables the quantity of sheets of each size to be determined by measuring the length of the stack taken up by sheets. An arm may be inserted between sheets of different sizes and the sheets moved along the sides for providing a substantial gap, for example of three inches, into which stillage may be inserted for separating lengths of the stack made up of sheets of different size. In removal of the stack the forks of a fork lift truck may then be inserted in the stillage and the sheets of each size removed separately from neighbouring sheets of a different size. Stillage is in any case usually present at the bottom of a stack and placed in the carrier with it and a distance peice may be inserted between the uppermost sheet in the stack and the holder.

The invention will be further described by way of example with reference to the accompanying drawings in which:

FIG. **1**, is a side elevation of the apparatus in the receiving position, the dotted lines being a side elevation of the operative position, and

FIG. **2**, is a top view of the apparatus in the receiving position, the arrow **18** showing the mode of loading the sheets.

A steel base plate **19** is employed as the bottom member stationarily mounted on a concrete floor by four antivibration pads **12** and two pedestals **14** bolted at opposite sides of the base plate house bearings in which the ends **15** of a shaft are carried, the shaft being secured across the centre of the square base **2** of a carrier. A hydraulic cylinder **21** having ram **6** is mounted between the base plate **19** and the carrier. In use the sheets **1,** usually with stillage **9** are loaded, facilitated by the conveyor rollers **3** mounted on roller-support plate structure **13** having upright roller-support walls **4;** the hydraulic cylinder **17** controls clamp **5,** to secure the sheets; the hydraulic cylinder **21** with its ram **6** to lower the carrier into the operative position thus operating the micro switch **7** which gradually releases clamp **5** and activates the vibrators **8** mounted on squaring walls **16***a* and **16***b*. The carrier is supported on a roller **11.** When squaring is complete the vibrators are deactivated and the clamp **5** secures the sheets on the carriers, and the ram **6** is activated to return the carrier to the unloading position, in which unloading position a micro switch **10** is operated to deactivate the ram **6** and prevent over-tilting. The clamp **5,** is released and the squared sheets are removed; the operation can then be repeated.

The apparatus may be constructed for receiving larger load or for receiving lighter material for example aluminium sheet. It will also be appreciated that it may be used for other materials, for instance, steel plate or card board, dimensioned for receiving small or large sheets and capable of squaring stacks of small sheets of paper.

I claim:

1. A sheet metal squaring apparatus comprising in combination: support means providing a pivot means on which a carrier means may be attached and pivoted; a carrier means including a base support structure receivable of a flat surface of a metal sheet bottom face for support of such metal sheet; the carrier means further including two separate flat-faced sides each extending uprightly from a plane in which the carrier means base support structure extends, and each flat-faced side extending laterally in a direction substantially perpendicular to the plane of the other flat-faced side; said carrier means being positioned and pivotably attached to the pivot means such that the base support structure is pivotable between alternate horizontal and substantially upright plane positions and such that when pivoted into the substantially upright position of the base support structure, the perpendicular planes are both pointed substantially angularly downwardly; clamp means mounted on the carrier means at a point such that stacked metal sheets are firmly clampable between the clamping means and the base support structure, the clamping means being adjustably clampable and releasable of a stack of metal sheets supported on the base support structure; and vibrator means mounted on the carrier means for selectively vibrating simultaneously the two separate flat-faced sides, the vibrator means including two separate vibrators one mounted fixedly on one of the two separate flat-faced sides and the remaining other vibrator mounted fixedly on the remaining other flat-faced side, and the vibrator means further including a micro-switch means for automatically activating the two separate vibrators when the carrier means is pivoted such that the base support structure extends in the substantially upright plane, and for automatically deactivating the vibration when the carrier means is pivoted to remove the base support structure from the substantially upright plane state.

2. A sheet metal squaring apparatus of claim **1,** in which the carrier means further includes roller means having at least one roller axis extending intersectingly transversely to one of the planes and substantially parallel to the remaining other plane of the two separate flat-faced sides and extending substantially parallel to the plane of the base support structure such that the rolling into place of a stack of metal plates onto the carrier means is facilitatable by use of the roller means.

3. A sheet metal squaring apparatus of claim **2,** in which the clamp means includes an axially movable flat-headed member controlably movable to and fro axially toward and away from alternately the base support structure in a direction about perpendicular to the plane in which the base support structure extends.

4. A sheet metal squaring apparatus of claim **3,** including a hydraulic cylinder means connected operatively between the support means and the carrier means for adjustably and controlably pivoting the carrier means between opposite pivot positions.

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