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Gilev et al.

[11] **3,765,150**

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[54] **DEVICE FOR PILING SHEET-MATERIAL STRIPS CUT BY ROTARY SHEARS**

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[52] **U.S. Cl.** **53/162,** 53/123, 83/86, 53/245

[51] **Int. Cl.** **B65b 35/50**

[58] **Field of Search** 53/162, 245, 163, 53/159, 123, 244; 270/52, 30; 83/86

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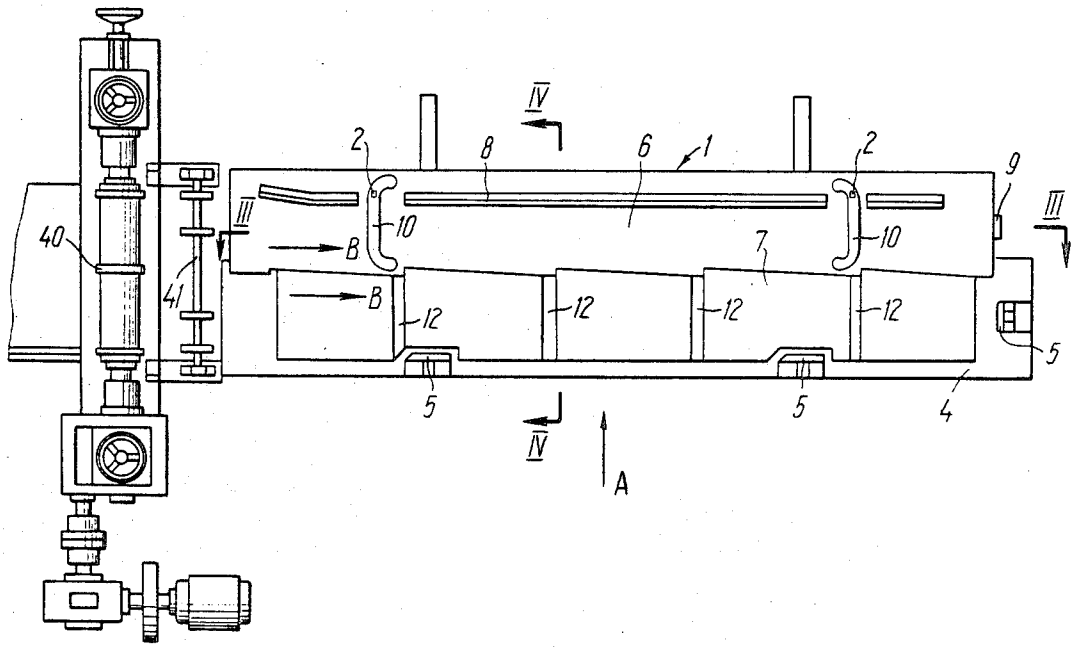
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Assistant Examiner—Horace M. Culver
Attorney—John G. Schwartz et al.

[57] **ABSTRACT**

The inclined receiving table in the device is divided at least into two longitudinal portions, of which the movable one is installed lower than the other, fixed portion, with a provision for moving under the latter in synchronism with the movement of the pusher knockouts while the piling table is installed under the movable portion, parallel to it, with a provision for being lowered as the container becomes gradually filled with strips.

4 Claims, 6 Drawing Figures



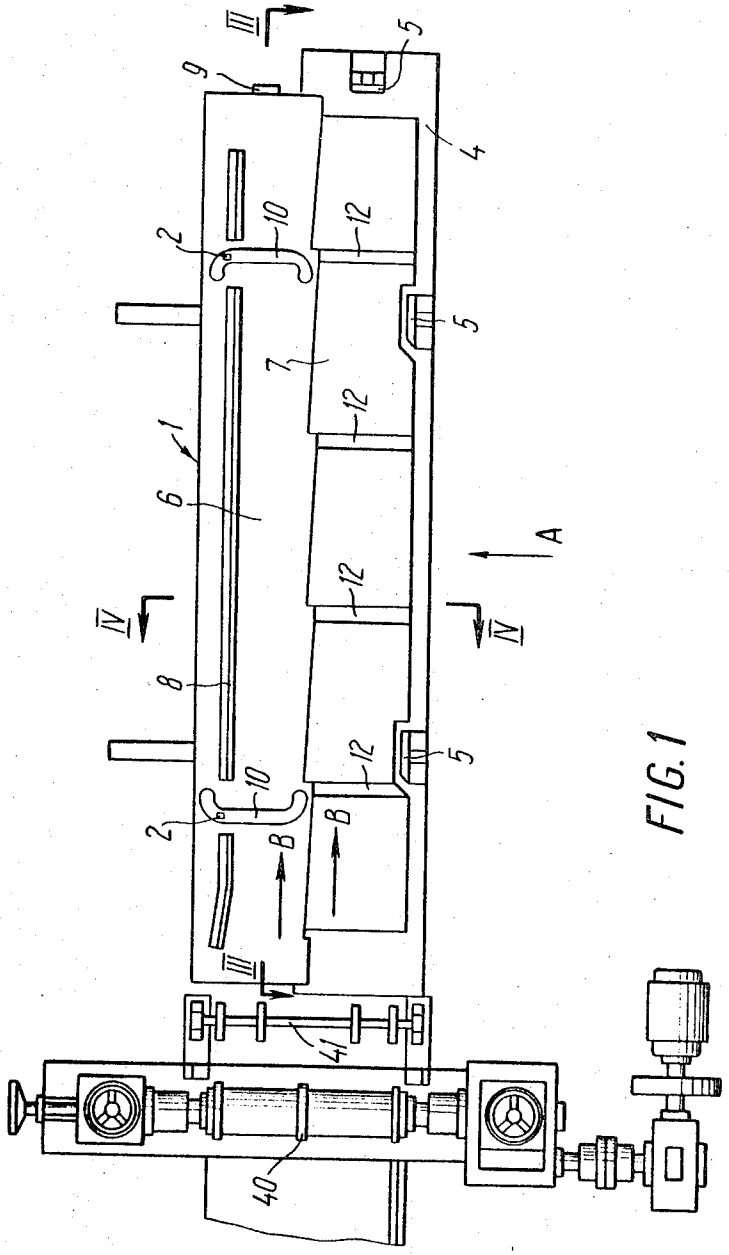


FIG. 1

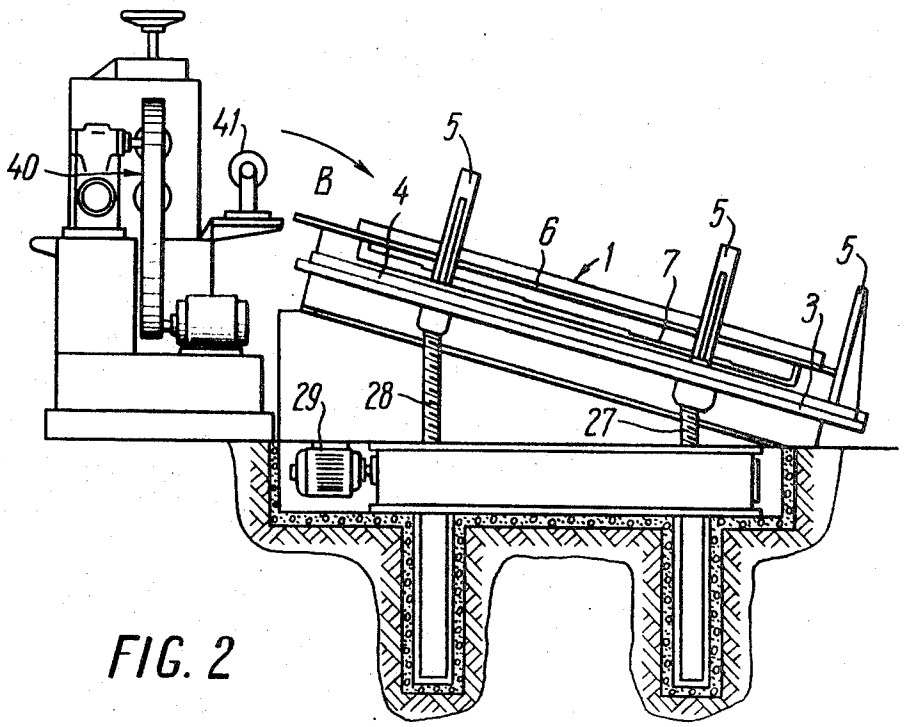


FIG. 2

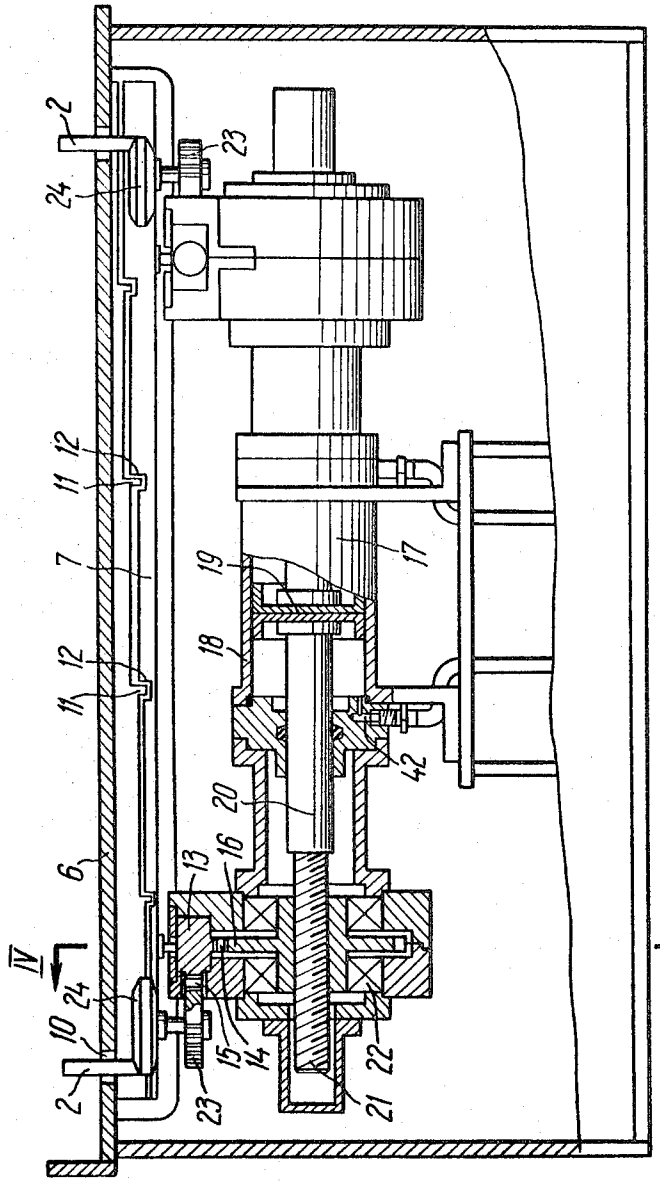


FIG. 3

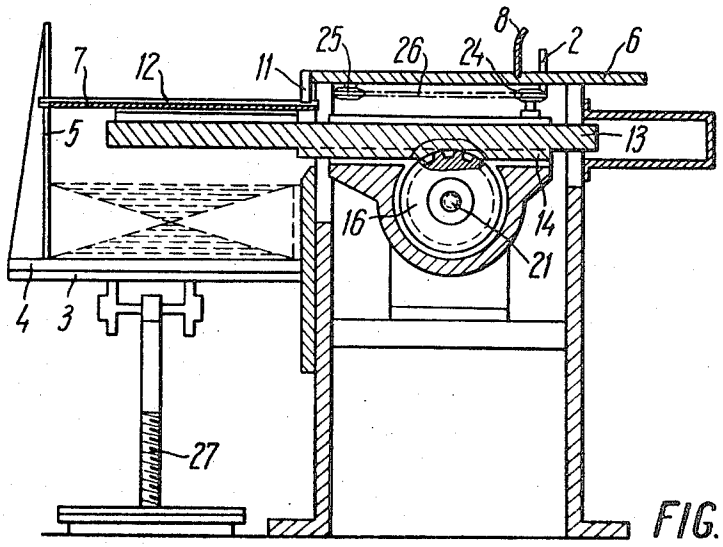

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FIG. 4

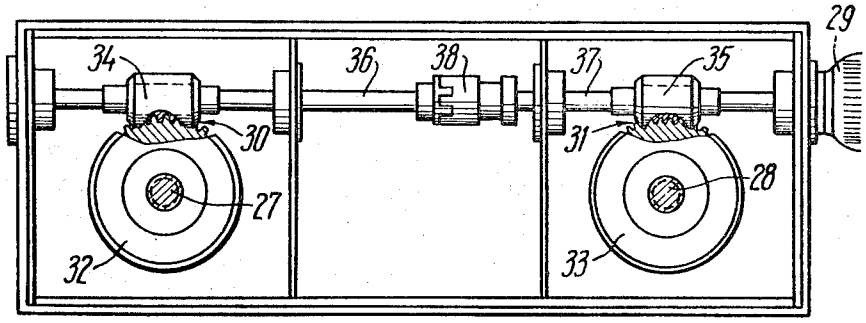

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FIG. 6

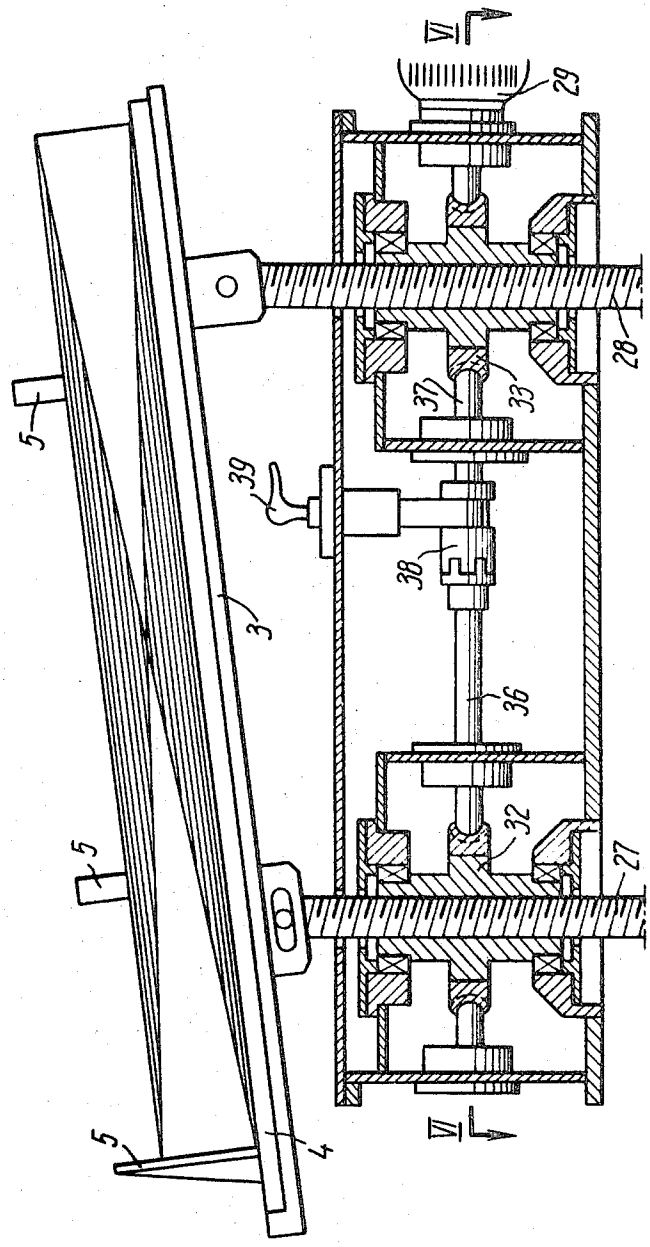


FIG. 5

DEVICE FOR PILING SHEET-MATERIAL STRIPS CUT BY ROTARY SHEARS

The present invention relates to the devices for pilling sheet material strips cut by rotary shears. It can be utilized in any branches of industry where automatic sheet-stamping presses handle sheet material laid in piles and where, consequently, accurate piling of the cut strips with aligned side and face edges is of vital importance.

Known at present are the devices for piling sheet material strips cut by rotary shears, comprising an inclined receiving table with pusher knockouts moving across the table, and a strip-piling table accommodating a container with catches.

Of late, automatic sheet-stamping presses have come into extensive use; their operation calls for a considerably high degree of orientation of the sheets or strips laid in piles before stamping, i.e., for aligning the sheets or strips with one another both on the side anf face edges (accurate within 0.5–1 mm). Otherwise the strips will not be brought with sufficient accuracy to the initial position before entering the stamping zone which may eventually lead to wastage of the manufactured parts.

The known devices for piling the sheet material strips fail to ensure a high degree of relative orientation of the strips. This is attributable to the fact that in the known devices the strips located on the inclined receiving table are collected by the transversely-movable pusher knockouts and thrown at once in a small pile into a container installed on a horizontal piling table which is located alongside of the inclined receiving table.

In this case the ends of the falling strips at the moment of knocking out are located at different levels with relation to the horizontal surface of the piling table and, when one end of the strip touches the surface of the container or of the upper strip in container, its other end describes an arc so that the strip acquires a certain centrifugal acceleration which displaces it, thus impairing its orientation. Besides, the strips fall from the receiving table not one after another but in a small pile formed of several strips by cross-moving pusher knockouts.

Therefore, the strips fall down in packs and cannot be displaced relative to one another for accurate orientation while being laid in a pile and the pusher knockouts installed on the side and face surfaces of the container cannot ensure accurate orientation of the strips being laid into the container; as a result, the strips being displaced by 5 millimeters and more. Therefore, very often it becomes necessary to transfer the strips by hand into a new container on the loading table of the automatic press for accurate alignment of the strips by the side and face edges.

An object of the present invention is to provide a device for piling the sheet-material strips cut by rotary shears which would ensure accurate relative orientation of the piled strips.

Another object of the present invention is to provide a device for piling strips which would prevent the produced strips from sticking together at the moment of their knocking out by pusher knockouts.

Still another object of the present invention is to provide a device for piling strips which would rule out turning and displacing of the strips being laid into the container on the piling table.

In accordance with these and other objects, in the device for piling the sheet material strips cut by rotary shears, comprising an inclined receiving table with pusher knockouts moving across the table, and a stripping table accommodating a container with catches, according to the invention, the inclined receiving table is divided into at least two longitudinal portions, a movable portion and a fixed portion, the former being set lower than the fixed portion and being capable of moving under the fixed portion of the table in synchronism with the movement of the pusher knockouts whereas the piling table is installed under the movable portion, parallel to it, with a provision for moving downward as the container becomes gradually filled with strips.

Such a solution of the problem allows the strips produced by cutting a sheet to be received on the different portions of the inclined receiving table. As the two portions of the table are set at different levels relative to each other, both strips fall into the container separately. Besides, arrangement of the piling table under the movable portion of the receiving table, parallel to it, with a provision for moving downward as the container becomes gradually filled, ensures a constant optimum distance through which the strips fall from the receiving table on the pile of strips in the container.

It is also practicable that the fixed portion of the table at the side directed to the movable portion should be provided with thrust dogs which push the strips from the movable portion of the table into the container when said movable portion moves under the fixed portion; the movable portion of the table has slots corresponding to the thrust dogs.

It is practicable that the movable portion of the receiving table should be moved in synchronism with the pusher knockouts by means of two rack-and-pinion mechanisms whose pinions are connected with the drive while the racks are connected with the movable portion of the table and each rack has two sets of teeth located on the adjacent mutually perpendicular sides, on set of teeth meshing with the pinion of the rack-and-pinion mechanism while the other one, with a gear which transmits the movement of the pusher knockouts in the direction opposite to that of the movable portion of the table, said movement being transmitted via sprockets and the flexible member on which the pusher knockouts are secured.

It is also practicable that the piling table should be lowered and lifted by means of two screw jacks articulated to the table, each jack being driven by an electric motor via a worm pair, the worm shafts being mounted coaxially and interconnected by a clutch; the piling table is set parallel to the receiving table by releasing the clutch which disengages one of the jacks.

Such a design ensures: setting of the piling table at any angle to the horizontal, including the position parallel to the movable portion of the table; uniform lowering of the piling table as the container becomes gradually filled with the cut strips, at the same time retaining the optimum distance between the receiving table and the upper strip in the pile on the piling table in which the falling strips retain the orientation that has been given them on the receiving table and are not scattered in the process of falling into the container.

As a result, it is possible to form accurately aligned piles on the piling table so that said piles can be used in the automatic presses without any intermediate rearrangement.

Now the invention will be described in detail by way of example of the realization of a device for piling sheet-material strips cut by rotary shears, with reference to the accompanying drawings, wherein:

FIG. 1 is a general top view of the strip-piling device according to the invention;

FIG. 2 is a view along arrow A in FIG. 1;

FIG. 3 is a section taken along line III—III in FIG. 1;

FIG. 4 is a section taken along line IV—IV in FIG. 3;

FIG. 5 is a longitudinal section of the mechanism for lifting and lowering the piling table;

FIG. 6 is a section taken along line VI—VI in FIG. 5.

The piling device comprises an inclined receiving table 1 (FIG. 1) with pusher knockouts 2 moving across said table, and a piling table 3 (FIG. 2) accommodating a container 4. The latter has catches 5 located along one of the side edges of the container and along one of its face edges. The inclined receiving table 1 is divided into two portions, a fixed portion 6 (FIG. 1) and a movable portion 7. The movable portion 7 is arranged somewhat lower that the fixed portion 6 with a provision for moving under the latter in synchronism with the movement of the pusher knockouts 2.

The fixed portion 6 of the receiving table is provided with an orienting bar 8 and with end catches 9 which ensure accurate orientation of the strips on this portion of the table.

The fixed portion of the table 1 has cross slots 10 moving through which are the pusher knockouts 2 for pushing the strip from the fixed portion 6 of the table 1 into the container 4 located on the piling table 3. Besides, the side of the fixed portion 6 facing the movable portion 7 carries thrust dogs 11 oriented downward (FIG. 3). These dogs push the strip into the container from the movable portion 7 of the table when said portion moves under the fixed portion 6.

The movable portion 7 of the table has slots 12 matching with the thrust dogs 11. The thrust dogs 11 of the fixed portion 6 move through the slots 12.

The piling table 3 (FIG. 2) is located under the movable portion 7 of the receiving table 1, parallel to it, and is capable of moving downward as the container 4 installed on it is gradually filled with strips.

The movable portion 7 is moved by two rack-and-pinion mechanisms whose racks 13 (FIGS. 3 and 4) are secured directly to said movable portion 7 of the table. These racks have two sets of teeth 14 and 15 on the adjacent mutually perpendicular sides, the teeth 14 being directed down.

The pinions 16 of the rack-and-pinion mechanisms meashing with the teeth 14 of the rack 13 are connected to a pneumatic drive 17 (FIG. 3).

The pneumatic drive 17 comprises an air cylinder 18 and a piston 19 moving in it under the pressure of compressed air, said piston being provided with two rods 20 pointing in opposite directions. The ends 21 of said rods have the form of multiple-thread screws meshing, each, with the pinions 16 of the rack-and-pinion mechanisms, said pinions provided with similar multiple-thread teeth for transforming lontitudinal motions of the rod 20 into rotary motions of the pinions 16 which rotate in bearings 22.

Synchronous operation of the pusher knockouts 2 with the movable portion 7 of the table is ensured owing to the fact that the drive of the pusher knockouts 2 is connected to the rack 13 of the rack-and-pinion mechanism which moves the movable portion 7 of the table.

The drive of each pusher knockout consists of a gear 23 and two sprockets 24 and 25 (FIG. 4) interconnected by a flexible linkage, i.e., chain 26 which carries the pusher knockout 2 oriented upward.

The sprocket 24 is a driving one and is located on a common axle with the gear 23 (FIG. 3). The gear 23 meshes with the teeth 15 of the rack 13. This ensures synchronous movement of the movable portion 7 of the table with the pusher knockouts 2, the latter being moved in the direction opposite to that of the movable portion of the table.

The piling table 3 (FIG. 5) carrying the container 4 is installed with a provision for being lowered as the container is gradually filled for which purpose said table is provided with two screw jacks 27, 28 which are connected with an electric drive 29 via the worm pairs 30 and 31 (FIG. 6); the worm wheels 32 and 33 of the worm pairs serve, respectively, as the nuts of the screw jacks 27 and 28 while the worms are mounted on the coaxial shafts 36 and 37 one of which, namely, shaft 37, is connected with the electric drive 29. The shafts 36 and 37 are interconnected by a clutch 38 actuated by a control handle 39 (FIG. 5).

To shift the piling table 3 from horizontal to the inclined position, parallel to the receiving table, the shafts 36 and 37 are disconnected by the clutch 38 and the table 3 is turned by one of the jacks only.

The claimed device functions as follows.

In the initial position, the piling table 3 is horizontal. The container 4 is set on the table 3 and, after releasing the clutch 38 by the handle 39, the electric drive is turned on.

The electric drive rotates the shaft 37 and the worm 35 (FIG. 6) which transmits rotation via the worm wheel 33 to the screw jack 28. As a result, one side of the table 3 is lifted. This lifting should be continued until the table 3 becomes parallel to the movable portion 7 of the table 1.

Then the clutch 38 is engaged by the handle 39 (FIG. 5). The shafts 36 and 37 are set coaxially which ensures operation of the jacks 27 and 28 and the latter lift the table until it comes to a distance which is optimum for the strips to fall from the inclined table 1 into the container 4.

Such a setting of the table is required for the strips falling from the table into the container 4 to be oriented by catches 5 without being scattered inside the container. It is possible first to lift the piling table 3 then to set it parallel to the movable portion 7 of the receiving table 1.

Then the sheets are started to be cut into strips.

The sheet to be cut passes through the rotary shears 40 (FIG. 1), is cut into two strips which, having passed through the deflecting rolls 41, move onto the portions 6 and 7 of the inclined table 1 in the directions shown by arrows B.

The strip entering the fixed portion 6 of the table 1 reaches the end catch 9 connected with a signal device (not shown) which starts the pneumatic drive 17 (FIG. 3) and the latter moves the movable portion 7 of the table.

Compressed air is fed through one of the channels 42 into one of the spaces of the air cylinder 18.

The piston 19 moves and the gears located on the ends 21 of the rod 20 in bearings 22 rotate, driving the

racks 13. The latter move the movable portion 7 of the table 1 to come under its fixed portion 6. Simultaneously, the racks 13 rotate the gears 23 which, in turn, rotate the sprockets 24 and 25 together with their chain 26 and the pusher knockout 2 so that the latter move in the direction opposite to that of the movable portion 7 of the table.

While the movable portion 7 of the table moves under the fixed portion, a space is vacated above the container 4 and the side edge of the strip lying on the movable portion 7 of the table 1 comes to bear against the thrust dogs 11 of the fixed portion 6 and is pushed by them from the withdrawing movable portion into the container 4.

Falling into the container 4, the strip is oriented by the container catches 5 (FIG. 2), the height from which the strip falls being so small that, owing to the parallel setting of the container and inclined receiving table, the strips are not scattered by the kinetic energy arising during the fall.

Simultaneously, the pusher knockouts 2 moving against the travel of the movable portion 7 of the table 1 push down the second strip from the fixed portion 6 of the table into the same container 4. Falling into the container 4 the second strip is also oriented by the catches 5.

Owing to the difference in the levels of the movable and fixed portions of the table, each of the two strips falls into the container 4 separately, without sticking to another strip which ensures independent orientation of the strips in the container by the catches 5.

After the second strip has been thrown down from the fixed portion 6 of the table, the same signal device which turns on the pneumatic drive switches over the supply of compressed air in the air cylinder 18. The piston 19 moves in the reverse direction and brings the movable portion 7 of the table from under the fixed portion 6, the pusher knockouts 2 returning to the initial position.

Then the cycle is repeated over again.

As the strips are accumulated in the container, the screw jacks 27 and 28 lower the piling table 3, retaining the selected optimum distance for falling of the strips from the receiving table 1 into the container. Any known type of the counter mechanism can be used to count the number of strips that have fallen into the container and to send a command signal for lowering of the piling table by the screw jacks with the clutch 38 engaged.

After the container has been filled, the rotary shears 40 are stopped and the filled container is replaced by an empty one. If necessary, the piling table 3 can be set to a horizontal position for this purpose.

What is claimed is :

1. A device for piling sheet material strips cut by rotary shears comprising: an inclined receiving table divided into at least two longitudinal portions adapted to receive the sheared strips, one of said table portions being movable, and the other table portion being fixed; said movable table portion being positioned lower than said fixed portion and adapted to move below the latter; a pusher knockout moving across said fixed portion synchronously with the movement of said movable portion and intended to knock the strips down from said fixed portion; a strip-piling table installed under said movable portion of the receiving table and extending parallel thereto and adapted to be moved downward as the strips are knocked down from said portions of the receiving table, said strip-piling table including means for accommodating a container with catches, said container receiving the knocked-down strips; a mechanism for moving said movable portion of the table in synchronism with said pusher knockouts; and a mechanism for lowering said strip-piling table as said container is gradually filled with strips.

2. A device according to claim 1 wherein the fixed portion of the table at the side facing the movable portion has thrust dogs which push the strips into the container from the movable portion of the table as it moves under the fixed portion, the movable portion having slots matching with the thrust dogs.

3. A device according to claim 1 wherein the movable portion of the table is shifted in synchronism with the pusher knockouts by means of two rack-and-pinion mechanisms whose pinions are connected with a drive while their racks are connected with the movable portion of the table and each rack has two sets of teeth located on the mutually perpendicular adjacent sides, one set of teeth meshing with the pinion of the rack-and-pinion mechanism while the other one meshes with the gear which transmits motion to the pusher knockouts via the sprockets and the flexible link in the direction opposite to that of the movable portion of the table.

4. A device according to claim 1 wherein the piling table is lowered and lifted by means of two screw jacks articulated to the table, each jack being connected with an electric drive via a worm pair whose worm shafts are coaxial and interconnected by a clutch, the piling table being set parallel to the movable portion of the receiving table on releasing the clutch which disengages one of the jacks.

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