

tion of the cycle, which corresponds to the position shown in greater mechanical detail in FIG. 1. In this position, the chutes 31 and 33 are in their lowermost position, and are on the vertical reference plane, and the silage is being delivered straight downwardly and backwardly toward the near wall of the silo.

At the end of about one-quarter of the cycle, the parts will be in the position shown schematically in FIGS. 8 and 9, the chutes being raised considerably upwardly from the position of FIGS. 6 and 7, but not at the extreme upward position. Also, the deflecting chutes will be tilted obliquely so that the open bottom of the main chute faces downwardly and leftwardly, as well as the chute being swung to its left limit of motion, and the silage will be delivered against the left part of the wall of the silo. This may be described for convenience as the 90° position, meaning that the crank arm 85 has turned 90° from its initial zero position of FIG. 1. This 90° position is shown in greater mechanical detail in FIGS. 4 and 5.

The 180° position is illustrated schematically in FIGS. 10 and 11. Here, the arm 85 has turned through 180° from the initial zero position, and the chutes are pointing straight forwardly, in the vertical reference plane, delivering silage to the far side of the silo. This corresponds to the position shown in FIG. 2.

Next, FIGS. 12 and 13 illustrate the parts in what may be called the 270° position, with the arm 85 turned through three-quarters of a complete revolution from its initial starting position. The chutes are now swung bodily to the right and also tilted obliquely to the right, silage being delivered to the right hand portion of the silo area.

As the rotation of the arm 85 continues, it swings on from its 270° position to its zero or starting position, bringing the parts back to the positions shown in FIGS. 1, 6, and 7.

The lateral tilting of the chute is indicated schematically in FIG. 14. At the left side of FIG. 14, the chute shown schematically at 31 is in its lowest position 221, with no lateral tilt. This is the position corresponding to FIGS. 1 and 6. As the cycle progresses, the chute is elevated and also tilts to the left, as indicated at 222, this being approximately the 90° position, shown also in FIGS. 8 and 9. As the cycle continues and the crank arm 85 reaches the 180° position, the chute in the diagram of FIG. 14 reaches the position 223, which is its highest position and it again points straight ahead, with no lateral tilt, this corresponding to FIGS. 2 and 10. Again, continuance of the cycle to the 270° position brings the chute somewhat downwardly and tilts it to the right, to the position shown at 224 in FIG. 14, this being also the position of FIG. 12. Finally, when the complete cycle is finished to 360°, back to the zero or starting position, the chute is lowered to its lowest position and straightened out with no lateral tilt, this being indicated at 225 at the right hand edge of FIG. 14, which is the same as the starting position 221 at the left hand edge.

Reference is now made to FIG. 15, which is a diagram illustrating the acceleration and deceleration of the speed of travel of the deflecting chute to its various positions, as compared with the uniform or constant speed of driving the crank arm 89 from the motor 101. The diagram illustrates the shaft 91, offset downwardly

or eccentrically with respect to the shaft 73 which carries the arm 85. The roller on the crank arm 89 is shown at 87, and this drives the arm 85. The circle 231 indicates the locus of the roller 87 as it revolves concentric with the shaft 91, while the circle 232 indicates the locus of the end of the arm 85, concentric with the shaft 73.

In the zero or starting position referred to in the preceding description, the arm 85 extends vertically upward in the position shown in full lines, and the driving roller 87 is in the position 241. In the 90° position, the drive roller 87 has moved to the position 242, and the arm 85 has swung clockwise through 90°, but it will be observed that the driving crank 89 carrying the drive roller 87 has only had to swing through somewhat less than 90° in order to bring the arm 85 to the 90° position. Hence this part of the motion of the arm 85 is relatively rapid, because it is accomplished by less than 90° of motion of the crank arm 89. But for moving the arm 85 from the 90° position to the 180° position (extending straight downwardly, as shown in broken lines) the crank arm 89 must travel through more than 90° to bring the roller 87 to the position shown at 243. So this part of the travel of the deflecting chute is slower, since more travel of the motor is needed.

In the third quadrant of movement, again more than 90° of movement of the crank arm 89 is needed from the 180° position to bring the driven arm 85 to the 270° position, with the drive roller 87 at the position 244. Thus again in this quadrant, the motion is relatively slow. In the final or fourth quadrant, less than 90° of travel of the crank arm 89 is needed to move the driven arm 85 from the 270° position to the 360° or zero position, so that the travel of the chute is faster.

It is through this eccentric arrangement of the drive shaft 91 with respect to the driven shaft 73, that it is possible to speed up the orbital cycle of the chute while delivering silage to the near side of the silo, and slow it down while delivering silage to the far side of the silo. This gives a more even distribution, because for a given degree of lateral swing of the chute, there is a greater area to be covered at the far side of the silo than when the chute swings laterally to an equal degree while delivering to the near side of the silo.

Finally, referring to the schematic diagram in FIG. 16, this is a diagram which is believed to aid in understanding the motion of the control rod 49 as it goes around its orbit. In this view, the point 251 indicates the pivot point of the control rod 49 about which the rod can swing in any direction, this point being the intersection of the axis of the vertical pivot of the yoke 43 with the axis of the horizontal pins 45 in this yoke. The circle 253 indicates the locus of the outer end of the arm 85 as it swings around its shaft 73. The circle 255 indicates the locus of the circular movement of the pivotal connection between the arm 75 and the rear end of the rod 49, this being the intersection of the radial axis (radial with respect to the shaft 73) on which the yoke 77 pivots relative to the arm 75, with the axis of the yoke pins 79 which connect with the sleeve 81 on the rear end of the rod 49. The circle 257 indicates the locus of the front end of the rod 49 as it swings around through its orbital movement.

When the arm 85 is in its zero or starting position, it stands upright in the position illustrated in FIG. 1, and

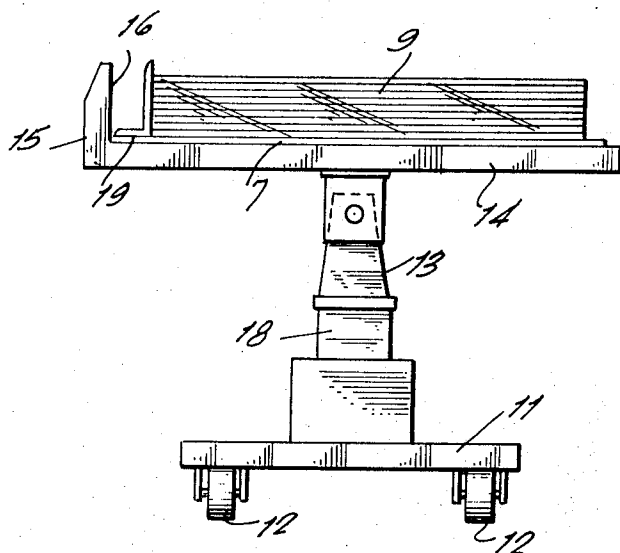


FIG. 2

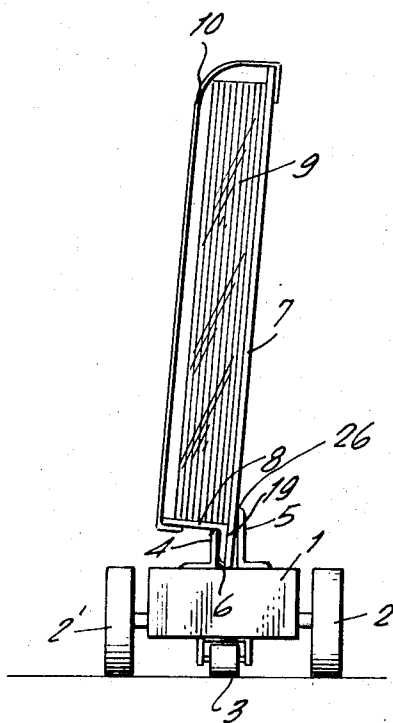


FIG. 1

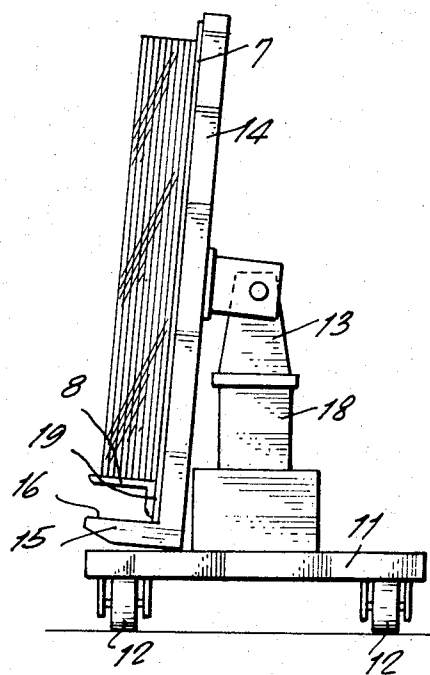


FIG. 3

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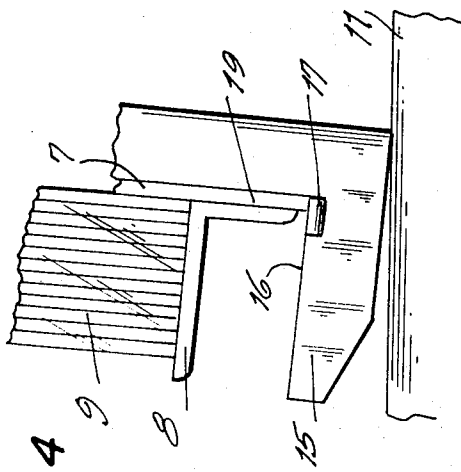


FIG. 4

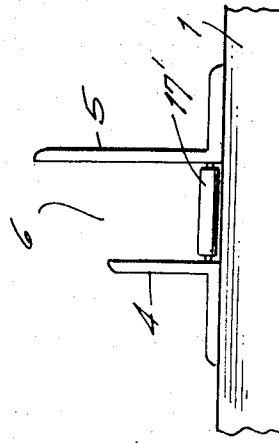


FIG. 5

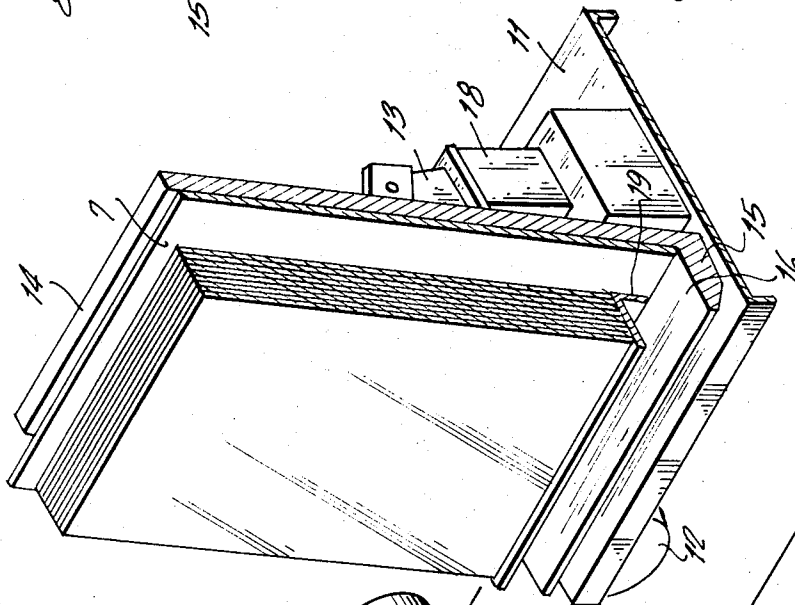
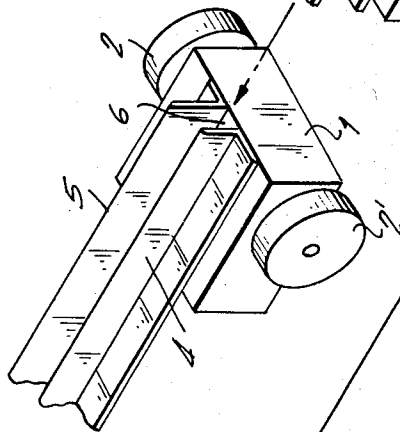


FIG. 6



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FIG. 9

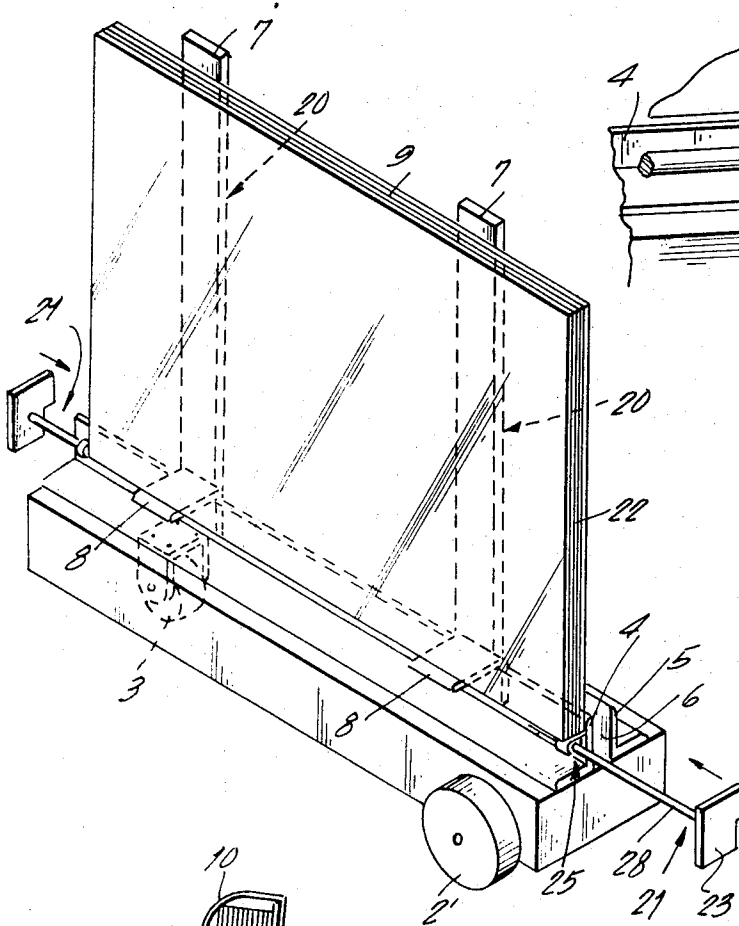


FIG. 10

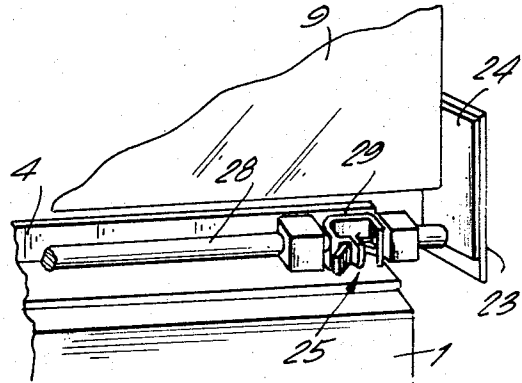


FIG. 7A

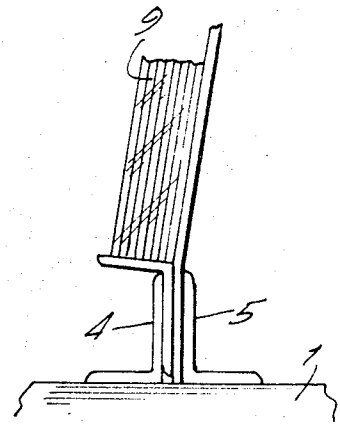


FIG. 7

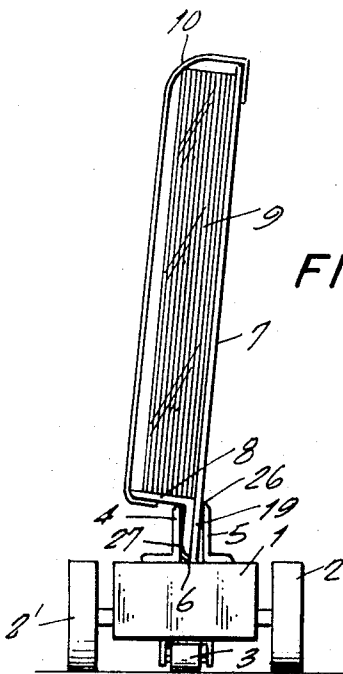
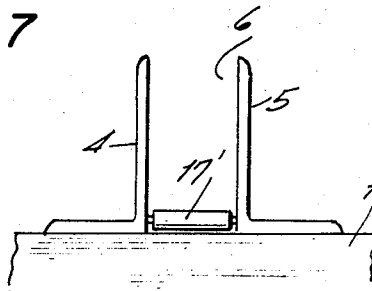


FIG. 8



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TRANSPORTING SYSTEM

The invention relates to a system for transporting material. More particularly, this invention relates to a two-component system comprising a transporter and a container. Optionally, a third component, an upender, is included. The system is particularly useful for transporting materials in sheet form.

Materials in sheet form are hard to handle. They are especially difficult to transport. Transportation of sheets individually is costly and obviously impractical. Transportation of bulk sheet material raises numerous problems. Some sheet materials, as for example plate glass, are extremely dangerous to handle. Should a sheet of plate glass break, the falling pieces are hazardous. They can maim anyone in their path. Devices for the transportation of sheet materials are known. Prior art devices are however disadvantageous in many respects. They are unduly complex in structure, costly, and generally require some degree of manual handling. The system of the present invention is intended to remedy these defects. The present invention provides a system which is simple and requires no manual handling. The entire system lends itself readily to automation.

Sheet material is stacked on the container of the present invention which is held on an upender. The container has a flange portion adapted for removable insertion into a channel on the transporter of the present invention. The upender then moves the container and stacked sheet material from a horizontal to a vertical position. The upender is then placed alongside the transporter so that the container flange is in alignment with the channel on the transporter base. Optionally, sliding means, as for example roller bearings, are provided in the channel and on the surface of the upender rest portion in contact with the flange of the container. This facilitates a simple ejection of the container from the upender into the channel on the transporter. Obviously, the above procedure may be reversed, the transporter being again placed alongside the upender so that the container flange is substantially in alignment with the surface of the upender rest, the container then being ejected from the transporter channel onto the upender.

The device of the present invention lends itself to numerous applications. Obviously, the system of the present invention permits the transportation of sheet material of any nature. Plywood, plate glass, sheet metal, and sheet plastic may be conveniently and simply handled. The system of the present invention will now be explained with reference to the accompanying drawings in which:

FIG. 1 is an end view of the transporter of the present invention showing the container of the present invention carried thereon;

FIG. 2 is an end view of the upender of the present invention in horizontal position showing the container of the present invention supported thereon;

FIG. 3 is an end view of the upender of FIG. 2 in its vertical position;

FIG. 4 is an enlarged side view of the upender of FIGS. 2 and 3 partially cut away to show the optional sliding means on the upender rest;

FIG. 5 is an enlarged end view of the transporter channel of FIG. 1 showing the optional sliding means therein;

FIG. 6 is a perspective view partially cut away showing the upender of FIGS. 2 and 3 and the container and transporter of FIG. 1, the upender and transporter being positioned for transfer of the container from the upender to the transporter;

FIG. 7 is an end view of an alternative embodiment of the transporter showing the container carried thereon;

FIG. 7A is a partial end view showing the container flange portion bent at an angle of 5° to 7°;

FIG. 8 is an enlarged end view of the transporter channel of FIG. 7 showing optional sliding means;

FIG. 9 is a perspective view of the transporter of FIG. 7 showing the use of two containers to carry sheet material and end gripping means on the transporter, and

FIG. 10 is a detail partial view of the end gripping means.

It should be noted that in the above drawings like elements have been assigned the same numerical designation for clarity's sake.

As shown in FIG. 1, the transporter of the present invention is comprised of a base 1 supported by fixed casters 2 and 2', and swivel-type caster 3. Casters 2, 2' and 3 are preferably removable so that they may be moved to alternate support positions on the base 1. A first upwardly extending channel side member 4 and a second upwardly extending channel side member 5 are mounted atop the base 1. Side members 4 and 5 form therebetween a channel 6. As shown in FIG. 1, side member 5 extends further upward from the surface of base 1 than does side member 4.

Alternatively and preferably as shown in FIGS. 7 and 8, side member 5 is equal in height to side member 4 from the surface of base 1. As shown in FIG. 1, the container comprises a back 7 and a first rest 8. Rest 8 is fixed to back 7 and is adapted to support sheet material 9 held within the container. Rest 8 is preferably fixed to back 7 in such a manner that back 8 and rest 7 form together a substantially T-shaped element. A flange 19 is positioned on back 7 and extends downwardly therefrom. Flange 19 is as shown in FIG. 1, preferably an extension of the back 7. Flange 19 is intended for removable insertion within channel 6. As recited heretofore, one channel side member may be higher than the other. When this is the case and the container flange portion 19 is within channel 6, the container will be supported therein at an angle as shown in FIG. 1. This angle is preferably 5°-7°.

When, as shown in FIGS. 7 and 8, the channel side members are equal in height and the container flange portion 19 is within channel 6, the flange portion will rest against points 26 and 27 and the sheet material 9 will be supported on the first rest 8 so that it is substantially parallel to the back 7.

Optionally, as shown in FIGS. 1 and 7, a cover 10 is fixed to back 7 so that the cover 10 overlays the sheet material 9. The cover 10 serves to protect the sheet material 9, as for example from dust or the elements. Cover 10 may be made of, for example, plastic or fabric. Preferably it is made of neoprene coated nylon. Back 7 may be made of, for example, iron, steel or wood. However, it may be made of any rigid material. If back 7 is made of wood, a reinforcing strip as, for example, a steel plate (not shown in the drawings) should

be fixed to that portion of the back which will contact the upper end of upwardly extending channel side member 5. This protects the soft wood back material against the harder side member 5.

The side members are preferably made of steel or iron. Alternatively, they can be made of wood. However, any rigid material is suitable. Back 7 may have affixed thereto a block having a bore. When transporting the container and transporter by, for example, a truck, the container and transporter can be held in place by placing a pin through, for example, a horizontal bar fixed to the truck sides and into the bore of the block fixed to the container back.

As shown in FIGS. 2, 3 and 6, the upender of the present invention is comprised of a second base 11 mounted on wheels 12, a support member 13 upwardly extending from and fixed to base 11, and an arm 14 pivotally connected to support 13. Support member 13 is preferably extendable; that is to say, its height in an upward direction from the base is adjustable. Arm 14 is, as shown in FIGS. 2 and 3, pivotable from a horizontal to a vertical position. A second rest 15 is fixed to arm 14. Rest 15 and arm 14 preferably form together a substantially L-shaped member. As shown in FIG. 2, the container is carried on arm 14 with the container back 7 resting against arm 14 and the container flange 19 directed towards rest 15. When arm 14 is in its vertical position, as shown in FIG. 3, the container flange 19 is in contact with the inner face 16 of rest 15.

The system of the present invention operates in the following manner. As shown in FIG. 2, sheet material 9 is loaded in the container which is held on the upender arm 14, the upender being in the horizontal position. Obviously, the container can be pre-loaded with the sheet material and then placed on the horizontally positioned upender arm 14. The upender is then pivoted to its vertical position as shown in FIG. 3. The upender and transporter are then positioned as shown in FIG. 6 so that the channel 6 on the transporter base 1 and the inner surface 16 of the upender rest 15 are substantially in alignment. To facilitate this, means 18 may be optionally provided on the upender for adjusting the height of the upender support 13 with reference to the upender base 11. This permits a corresponding adjustment of the distance of rest 15 and inner surface 16 from the upender base 11. The container and its sheet material contents may then be readily transferred from the upender into the transporter channel 6. The overall effect is similar to injecting a razor blade into an injector razor.

As shown in FIG. 4, roller bearings 17 may be optionally provided on the upender rest 15. Roller bearings 17 are as shown in FIG. 4 preferably recessed in the inner surface 16 of rest 15. As shown in FIG. 5, roller bearings 17 may be optionally provided in the channel 6 on the transporter. Roller bearings 17 and 17' facilitate the injector action. Of course other means for reducing friction and facilitating this slide injector action may be utilized. For removing the container from the transporter the process is reversed. The upender and the transporter are again positioned so that the channel on the transporter and the upender rest are substantially in alignment with one another. The container can then be ejected from the channel onto the upender rest. As an alternative to this ejection

of the container, means can be provided for reaching out and lifting the container out of the transporter channel, said means then upending the container.

Referring now to FIG. 9, it is obvious that the unit heretofore referred to as "the container" can be divided into one or more cooperating container elements 20. These container elements 20 are used in conjunction with the transporter unit described heretofore. The container elements 20 so to speak take the place of the full length container of FIGS. 6 and offer greater flexibility of use. They permit the handling of many materials of various lengths. Clearly the container elements 20 can be of any width. Obviously as their width is increased, one approaches the embodiment of the container of FIG. 6.

As shown in FIGS. 9 and 10, end gripping means 21 are advantageously carried at each end of the transporter. End gripping means 21 serve to lock the sheet material at its ends 22 and also act to limit horizontal movement of the sheet material along the length of channel 6 of the transporter. Preferably end gripping means 21 are slidably mounted on the transporter and are comprised of a rear plate 23 and a rubber face plate 24 mounted on rear plate 23. Both plates are slidably mounted on pipe 28 carried on the transporter. Pipe 28 communicates with a clamp 29. This arrangement constitutes a standard sliding lock mechanism 25 which is well known to those in the art. Two such units are employed, one at each end of the transporter. As shown in FIG. 9, the end gripping means 21 are each slidably movable to contact the ends 22 of the sheet material and hold same firmly.

A reading of the instant specification taken together with the drawings will suggest to the skilled artisan other modifications of the instant system. For instance, the transporter base 1 and channel side members 4 and 5 which define channel 6 can be readily replaced by utilizing instead a channel-shaped base. This channel-shaped base is in end view substantially U-shaped. One side of the channel-shaped base may be higher than the other side. This channel-shaped base can be made movable by affixing thereto wheels 2, 2' and 3.

Still further, referring now to FIG. 7A, the container flange portion 19 can be preferably bent at an angle of 5°-7° so that when portion 19 is inserted within channel 6 the back rest 7 will be at an angle of 5°-7° and the flange portion 19 will be substantially perpendicular to the base of channel 6. This permits one to obtain the 5°-7° angle and to maintain side members 4 and 5 at the same height from the base.

What is claimed is:

1. A transporter system comprising a channel having a first side and a second side and a container having a back, a rest fixed to the back, said rest and back being adapted to support material thereon, a flange on said back, said flange extending downwardly from the back and being removably insertable within said channel and an upender comprising a support, an upwardly extending member on said support, an arm pivotally mounted on said upwardly extending member, said arm being pivotable from a first substantially horizontal position to a second substantially vertical position, a second rest having an inner surface on said arm, said arm and said second rest being adapted to receive said container with the container flange oriented toward the inner sur-

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face of the second rest and means for transferring the container from the channel onto the arm or from the arm into the channel.

2. The system as described in claim 1, further including friction reducing means in said channel and on the inner surface of said second rest to facilitate slidable transfer of the container flange from the channel onto the arm or from the arm into the channel.

3. The system as described in claim 1, wherein said upender further comprises means for adjusting the distance of the inner surface of the second rest from the upender base when the arm is in the second position.

4. A transporter system comprising a channel having

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a first side and a second side and a container having a back, a rest fixed to the back, said rest and back being adapted to support material thereon, a flange on said back, said flange extending downwardly from the back and being removably insertable within said channel, means for gripping the ends of material supported on said container rest and back, said means comprising a plate mounted on the channel, said plate being slidably movable to contact an end of said material.

5. The system as described in claim 4, wherein one said plate is provided at each end of the channel.

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