March 12, 1957 W. B. CONNELL 2,784,831

AUTOMATIC INVERTER

Filed Feb. 16, 1954 3 Sheets-Sheet 1

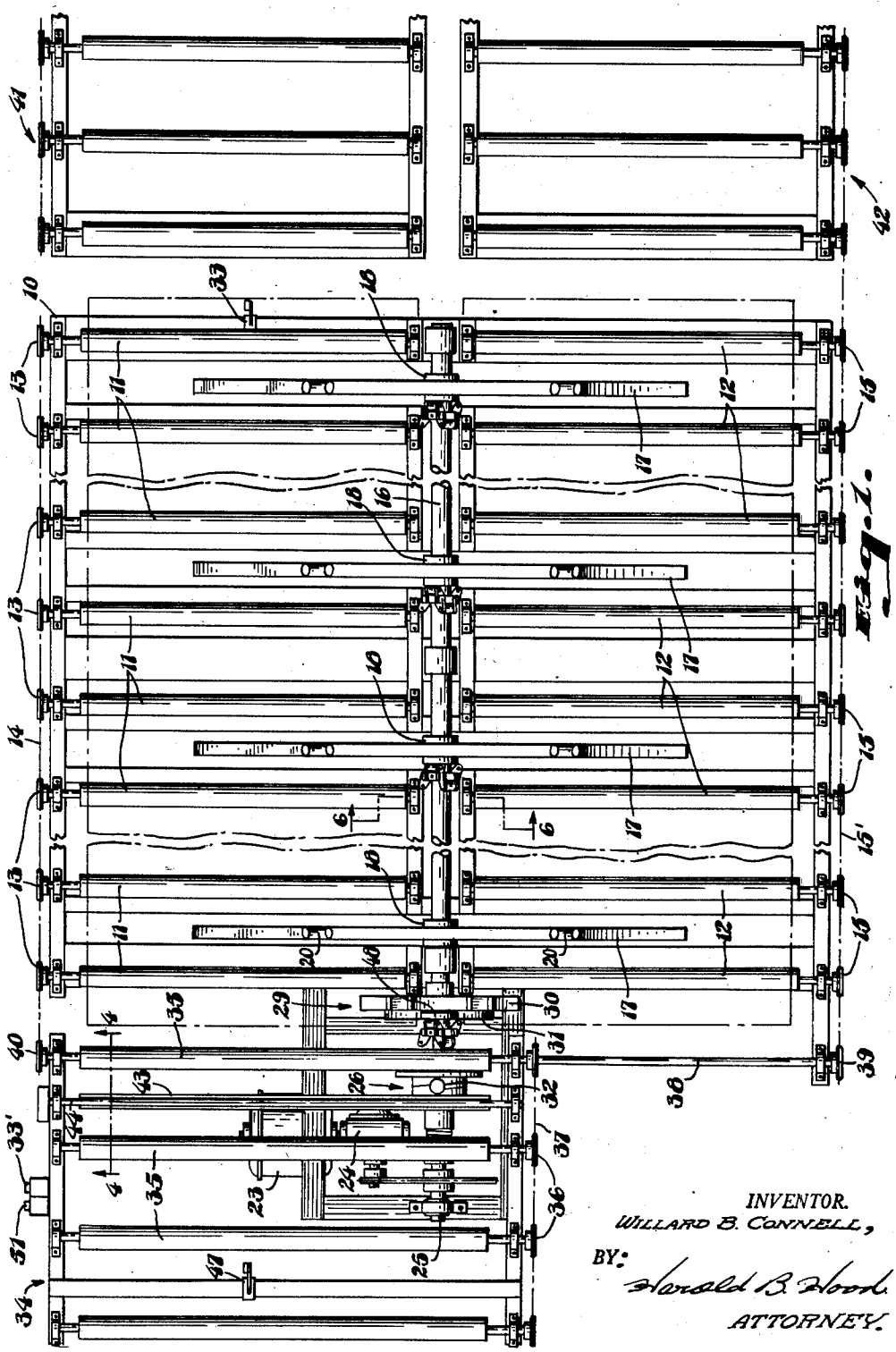


Fig. 1.

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AUTOMATIC INVERTER

Filed Feb. 16, 1954 3 Sheets-Sheet 2

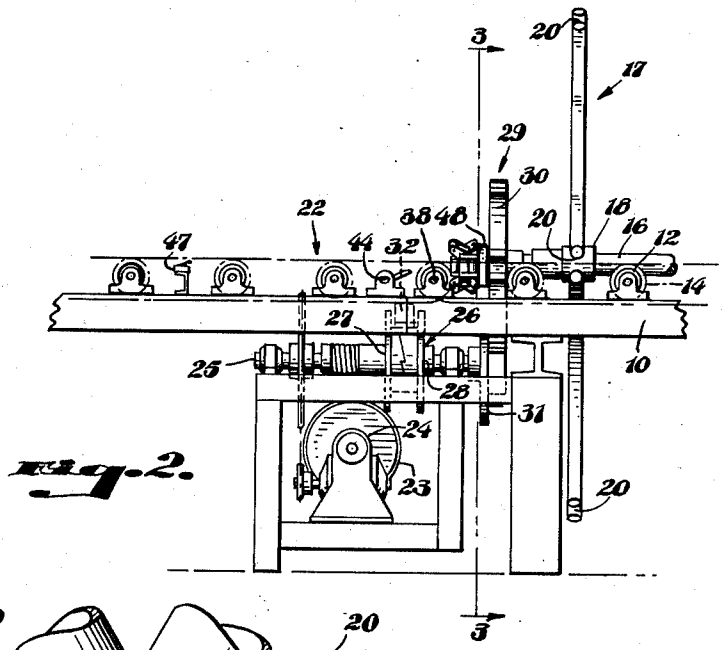



Fig. 2.

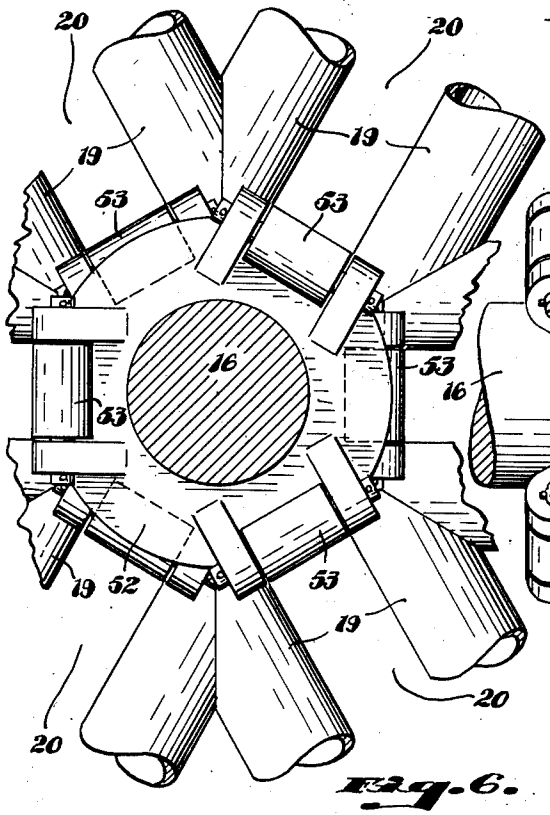



Fig. 6.

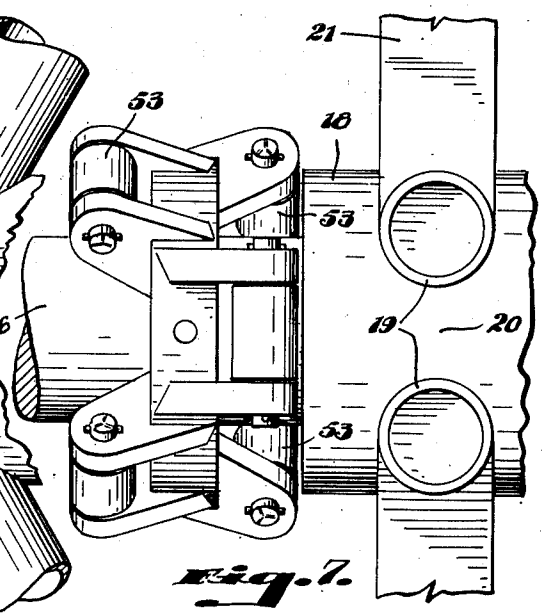



Fig. 7.

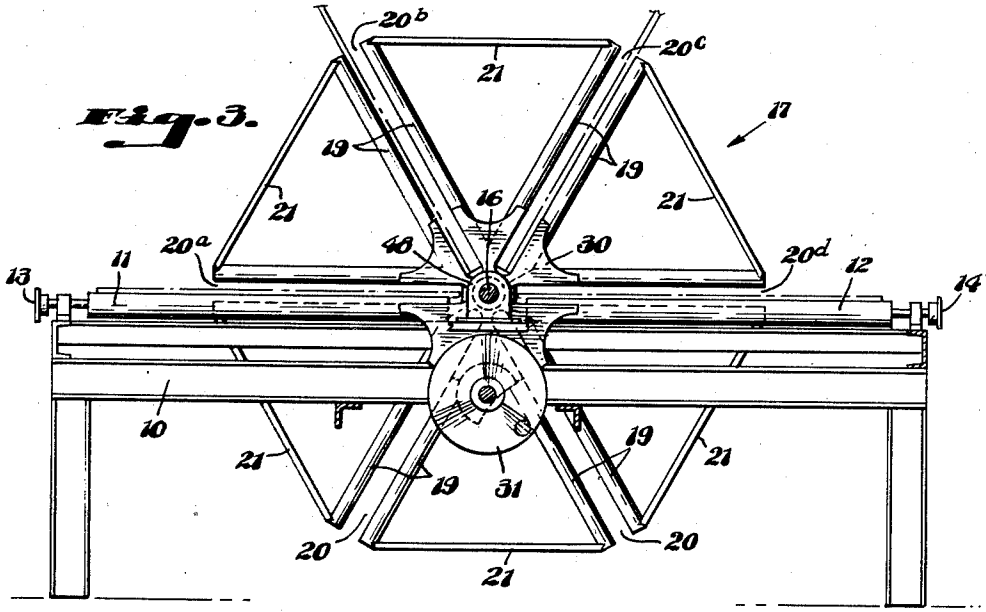
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AUTOMATIC INVERTER

Filed Feb. 16, 1954 3 Sheets-Sheet 3

Fig. 3.



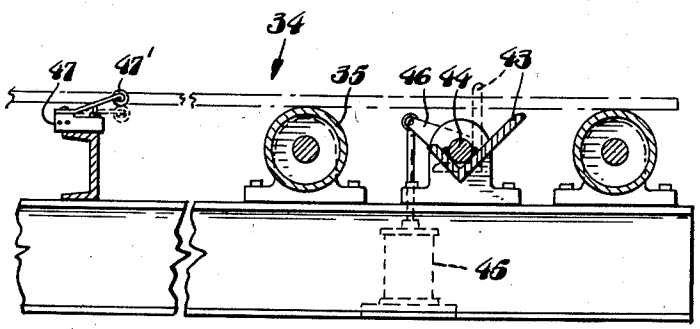




Fig. 4.

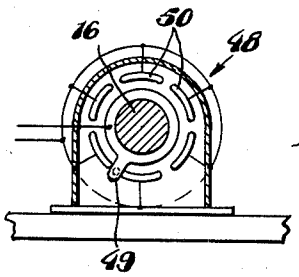



Fig. 5.

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2,784,831

# AUTOMATIC INVERTER

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Application February 16, 1954, Serial No. 410,593

3 Claims. (Cl. 198—33)

The present invention relates to an automatic inverter and specifically to a machine for use in inverting sheets of plaster board, or the like.

In order to protect the finished surface of a sheet of plaster board material, it is preferable, when bundling together such sheets, to invert the uppermost sheet in a stack to expose an unfinished surface on both sides of the stack. The size of the plaster board sheets, with which this invention is primarily concerned, makes it extremely difficult for the sheets to be inverted manually without marring or otherwise damaging the sheet material. It is the primary object of this invention, therefore, to provide a machine for receiving and inverting a sheet of plaster board material, or the like, and to do so in a completely automatic manner.

A further object is to provide, in such a machine, means for selectively inverting certain sheets passing through the machine and for permitting other sheets to pass through the machine without being inverted.

Another object is to provide, in such a machine, conveyor means for delivering the sheet material serially to the machine and means for preventing delivery of such material to the machine whenever the machine is not properly adjusted to receive the material.

Further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the form illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that change may be made in the specific construction illustrated and described so long as the scope of the appended claims is not violated.

Fig. 1 is a plan view of my inverting machine;

Fig. 2 is a fragmentary side elevation of the driving mechanism of the machine;

Fig. 3 is a transverse sectional view, taken substantially on line 3—3 of Fig. 2, and showing further details of the driving mechanism of the machine;

Fig. 4 is a fragmentary sectional view taken substantially on line 4—4 of Fig. 1 showing a detail of the sheet flow-control means of the machine, and drawn to an enlarged scale;

Fig. 5 is an enlarged sectional view through the selector switch constituting a part of the sheet flow-control mechanism of the machine;

Fig. 6 is a greatly enlarged sectional view, taken substantially on line 6—6 of Fig. 1, and showing a detail of the sheet-supporting mechanism of the machine; and

Fig. 7 is a side elevation of the mechanism of Fig. 6.

Referring more particularly to the drawings, the inverting machine proper comprises a frame **10** having thereon a first plurality of roller means **11** journalled for rotation about spaced, substantially parallel axes lying in a substantially horizontal plane and constituting a first, sheet-supporting bed. A second plurality of roller means **12** is similarly supported on frame **10** and journalled for rotation about spaced, substantially parallel axes, preferably coaxial with the axes of roller means **11**; the roller means **12** constituting a second, sheet-supporting bed substantially coplanar with the bed of roller means **11**. Roller means **11** are each provided with a sprocket **13** drivingly connected together by means of an endless chain **14**. Roller means **12** are each similarly provided with a sprocket **15** drivingly connected together by means of an endless chain **15'**.

A shaft **16** is mounted on frame **10** in suitable bearings and is journalled for rotation about an axis lying between the adjacent ends of roller means **11** and **12** and substantially in the planes of the beds of said roller means. A plurality of rotor means **17** is fixed to shaft **16** for rotation therewith between certain of the adjacent ones of the roller means **11** and **12**.

Each of such rotor means **17** (see Fig. 3) comprises a hub **18** fixed to shaft **16** and supporting a plurality of spoke members **19**. Such spoke members are arranged in pairs extending radially from hub **18** and spaced apart slightly to form slots **20** between each of said pairs. As will be seen from an inspection of Fig. 3, the spoke pairs are so arranged, and are of such a number, that one of the slots **20** will register with the bed of roller means **11** at the time when another of said slots is in registry with the bed of the roller means **12**. The slots in the adjacent rotor means **17** are, of course, arranged to lie in common planes including the axis of shaft **16**. In order to lend rigidity to the rotor means **17**, I prefer to connect together the distal ends of the spoke members **19** by means of straps **21**.

For the purpose of this invention, it is necessary that the shaft **16** be driven intermittently to move the slots **20** from registry with the bed of roller means **11** upwardly and across shaft **16** and into registry with the bed of roller means **12**, shaft **16** being caused to pause momentarily with diametrically opposite slots **20** in registry with the beds of roller means **11** and **12**. To this end I provide driving means, referred to generally by the reference numeral **22** (see Fig. 2), comprising a motor **23** drivingly connected through a speed reduction unit **24** to a shaft **25**. A single-revolution clutch **26** has one portion **27** fixed to shaft **25** and the mating portion **28** free for rotation relative to said shaft. A Geneva driving train, referred to generally by the reference numberal **29**, has the wheel portion **30** fixed to shaft **16** and the pawl portion **31** drivingly connected to the portion **28** of the clutch **26**. The clutch **26** is here shown as being actuated by means of a magnetic unit **32**.

Upon energization of the unit **32**, clutch **26** will be actuated and the pawl portion **31** of the Geneva drive **29** will be driven through one revolution. This will move the Geneva wheel **30** through a certain portion of a revolution, depending upon the number of slots **20** in the rotor means **17**. In the illustrated embodiment, there are six such slots and, upon a single revolution of the Geneva drive, shaft **16** will be rotated through one-sixth revolution, moving slot **20*a*** from its illustrated position in Fig. 3 to the position **20*b***. Upon the next rotation of the Geneva drive, slot **20*a*** will be moved to the position **20*c***, and upon a further rotation of the drive, slot **20*a*** will be moved to the position **20*d***. Thus, three rotations of the Geneva drive **29** will move a slot **20** out of registry with the bed of roller means **11** and into registry with the bed of roller means **12**.

The single revolution clutch **26** is actuated upon the closing of a switch **33** supported near one end of the bed of roller means **11**. Switch **33** is closed upon engagement by a sheet of plaster board moving onto the bed of the roller means **11**. As a sheet of such material is moved onto the bed of the roller means **11**, it will enter

into the slots 20 then in registry with said bed and, upon closure of switch 33, the clutch 26 will be energized to move shaft 16 through one-sixth revolution lifting the sheet of material off the bed of roller means 11. After two more such actuations of clutch 26, that sheet will be deposited upon the bed of roller means 12 in an inverted position. Roller means 12 will then move the sheet to the right, as viewed in Fig. 1, off of the bed of roller means 12.

It is desirable that certain of the sheets moving onto the bed of the roller means 11 be permitted to pass through the slots 20 and off of said bed without being inverted onto the bed of roller means 12. To this end, I provide a manually operated switch 33' electrically connected in series with the switch 33 so that, upon operation of switch 33', switch 33 will be inactivated. Closure of switch 33 will then fail to energize clutch 26 and the sheet of material will be permitted to move off of the bed of the roller means 11.

In order to deliver the sheet material automatically to the inverting machine, I provide a first conveyor 34 arranged with its output end adjacent the input end of the bed of the roller means 11. Such conveyor is here shown as comprising a plurality of roller means 35 each provided with a sprocket 36 drivingly connected together by means of an endless chain 37 and driven by some means not here shown. I prefer to drive the roller means 11 and 12 in synchronism with the roller means 35, and, to this end, I provide a shaft 38 constituting an extension of the shaft of the roller means 35 nearest the bed of roller means 11. A sprocket 39 is fixed to one end of shaft 38 and the chain 15' is trained about said sprocket. A sprocket 40 is fixed to the opposite end of the shaft and the chain 14 is trained about said sprocket to drive roller means 11.

It is essential, of course, that no sheet of material be delivered to the bed of the roller means 11 at any time when all of the slots 20 are out of registry with the bed of the roller means 11. Since the sheet material will not always be properly spaced along the conveyor 34 to insure the arrival of such a sheet at the input end of the bed of roller means 11 at the correct time, it is necessary that some means be provided for holding back an approaching sheet until the slots 20 come into registry with the bed of the roller means 11 and the rotor means 17 are in a stationary condition. To this end, I provide stop means comprising a leaf member 43 fixed to a shaft 44 journalled in the frame of conveyor 34 for swinging movement of one edge of the leaf into and out of the path of an approaching sheet. Motor means, such as the solenoid 45, is drivingly connected through a crank 46 to shaft 44. As here shown, the leaf 43 normally occupies a position out of the path of an approaching sheet and is moved, upon energization of the solenoid 45 into its illustrated dotted line position, shown in Fig. 4, to block the path of an approaching sheet of material. A switch 47 is arranged on conveyor 34 ahead of the stop leaf 43 for dominating the solenoid 45. A selector switch 48 (see Figs. 1, 3 and 5) has a sweep contact 49 fixed to shaft 16 and a plurality of fixed contacts 50 electrically connected together. The selector switch is so adjusted that the sweep contact 49 will engage one of the stationary contacts 50 at any time when there are no slots 20 in registry with the beds of the roller means 11 and 12. Switch 47 is normally open and its movable element 47' is arranged to be engaged by an approaching sheet to close the switch. Switch 47 is electrically connected in series with the selector switch 48. Upon closure of switch 47, assuming that certain of the slots 20 are then in registry with the beds of the roller means 11 and 12, contact 49 will be out of engagement with the stationary contacts 50 in selector switch 48, and the solenoid 45 will not be energized. The sheet will, therefore, pass over the stop leaf 43 and onto the bed of the roller means 11 into the slots 20 then in registry with said bed. Should the rotor means 17 be in movement at the time when a sheet closes switch 47, the sweep contact 49 will be in engagement with one of the stationary contacts 50 in switch 48, and an energizing circuit for solenoid 45 will be established through switches 47 and 48 moving the leaf 43 into the path of the approaching sheet of material. Movement of the sheet will, thereby, be arrested until movement of the rotor means 17 ceases with certain of the slots 20 in registry with the bed of roller means 11. At that time, the energizing circuit for solenoid 45 will be broken, permitting the leaf 43 to move to its illustrated solid line position in Fig. 4, and the sheet member will be released to move on toward the bed of the roller means 11.



A second conveyor means 41 is arranged at the output end of the bed of roller means 11 to receive those sheets of material which pass over said bed without being picked up by the rotor means 17 for movement to the bed of the roller means 12. A third such conveyor means 42 is similarly arranged at the output end of the bed of the roller means 12 to receive those sheets which are inverted by the rotor means 17.

It is sometimes desirable that a sheet of material approaching the bed of the roller means 11 be removed from conveyor 34 before it reaches the bed of the roller means 11. I prefer, therefore, to provide a manually operated switch 51 (see Fig. 1) connected to energize solenoid 45 independently of switches 47 and 48 whenever it is desirable on the part of the operator to hold back any sheet moving toward the bed of the roller means 11 in order to facilitate removal of such sheet from conveyor 34.

In order to protect the edges of the sheets of material during their movement in the rotor means 17, I prefer to provide means for holding the sheets away from the hubs of said rotor means. To this end, I provide a carriage member 52 fixed to shaft 16 immediately ahead of each of the rotor means 17, and on the end of shaft 16 immediately ahead of the selector switch 48. Each carriage member 52 is provided with a plurality of antifriction rollers 53. There is one such roller for each of the slots 20 in the rotor means 17, and each roller is mounted for rotation upon an axis substantially normal to the spoke means 19 defining the respective slots 20. The peripheries of the rollers 53 extend slightly beyond the peripheries of the hubs 18 and are, preferably, formed of a resilient, non-abrasive material such as rubber, or the like. Each sheet of material being inverted will, thereby, be supported throughout its length out of contact with the hubs 18.

The machine, as described, makes it possible to do a job, heretofore performed almost entirely by hand, in a completely automatic manner. The use of the machine not only makes possible a substantial saving in time and labor, but results also in a substantial reduction in the percentage of damage to such sheet material which has heretofore resulted from the necessity of having to manipulate such material by hand.

I claim as my invention:

1. In a machine of the class described, the combination of a first conveyor means adapted to support a sheet of material and driven to move said sheet in one direction, a second conveyor means arranged adjacent said first conveyor means, a shaft mounted between the adjacent boundaries of said conveyor means, rotor means fixed on said shaft and provided with a plurality of slots each registrable with the plane of said first conveyor means when said shaft is in one position, and registrable with the plane of said second conveyor means when said shaft is in another position, a sheet of such material being moved by said first conveyor means into those slots then in registry therewith, motor means for intermittently driving said shaft to move said slots from their first-said position to their second-said position, means engageable by such a sheet as it is so moved into said slots to actuate said motor means to lift such sheet off said first conveyor

means and deposit it, in an inverted position, on said second conveyor means, said second conveyor means then moving said sheet out of said slots, and manually controllable means, cooperating with said means for actuating said motor means, for inactivating said motor-actuating means to prevent actuation of said motor means, as a sheet of such material is moved into the rotor slots, to permit said first conveyor to move said sheet through said slots in an uninverted position.

2. A machine for inverting sheet material comprising frame means, a shaft journalled on said frame means for rotation about a substantially horizontal axis near the median plane of said frame means, a first plurality of roller means journalled on said frame means on one side of said shaft for rotation about spaced, substantially parallel axes substantially normal to the axis of said shaft, but spaced downward therefrom, with said roller means tangent to a substantially horizontal plane including the axis of said shaft to provide a first bed, a second plurality of roller means journalled on said frame means on the opposite side of said shaft for rotation about spaced substantially parallel axes substantially normal to the axis of said shaft, but spaced downward therefrom, with said roller means tangent to said horizontal plane including the axis of said shaft to provide a second bed, a plurality of rotor means fixed to said shaft for rotation therewith between certain of said roller means, said rotor means each being formed to provide an equal number of radially extending slots opening through the periphery thereof, such slots of the adjacent rotor means being arranged in common planes including the axis of said shaft with the slots in each of said common planes being adapted to register first with the plane of said first bed and then with the plane of said second bed, means for intermittently driving said shaft to move said slots in said common planes out of registry with said first bed and into registry with said second bed, each rotor means comprising a hub fixed to said shaft, and a plurality of pairs of spoke means fixed to said hub and extending radially therefrom in a common plane substantially normal to said shaft, the spokes of each such pair being substantially parallel and spaced slightly to form said slots in said rotor means, a carriage for each of said rotor means fixed to said shaft adjacent said hub, said carriage supporting an anti-friction roller in the plane of each of the slots in said rotor means for rotation about an axis substantially normal to the spokes of the respective pairs, the periphery of each of said rollers extending radially beyond the periphery of said hub to support the edge of a sheet of such material.

3. A machine for inverting sheet material comprising frame means, a shaft journalled on said frame means for rotation about a substantially horizontal axis near the median plane of said frame means, a first plurality of roller means journalled on said frame means on one side



of said shaft for rotation about spaced, substantially parallel axes substantially normal to the axis of said shaft, but spaced downward therefrom, with said roller means tangent to a substantially horizontal plane including the axis of said shaft to provide a first bed, a second plurality of roller means journalled on said frame means on the opposite side of said shaft for rotation about spaced substantially parallel axes substantially normal to the axis of said shaft, but spaced downward therefrom, with said roller means tangent to said horizontal plane including the axis of said shaft to provide a second bed, a plurality of rotor means fixed to said shaft for rotation therewith between certain of said roller means, said rotor means each being formed to provide an equal number of radially extending slots opening through the periphery thereof, such slots of the adjacent rotor means being arranged in common planes including the axis of said shaft with the slots in each of said common planes being adapted to register first with the plane of said first bed and then with the plane of said second bed, means for intermittently driving said shaft to move said slots in said common planes out of registry with said first bed and into registry with said second bed, means for continuously driving the roller means of both beds in a common direction, switch means dominating said shaft-driving means and adapted to be engaged by the advancing sheet to activate said shaft-driving means, a first conveyor means arranged with its output end adjacent the input end of said first bed and adapted to move a sheet of such material onto the rollers of said first bed, a second conveyor means arranged with its input end adjacent the output end of said first bed, and a third conveyor means arranged with its input end adjacent the output end of said second bed to receive the inverted sheets of such material as they are moved out of said slots by the roller means of said second bed, and a manually controlled switch electrically connected in series with the said switch dominating said shaft-driving means, operation of said manually controlled switch acting to inactivate the first-said switch to permit said roller means of said first bed to move the sheet through said slots and onto said second conveyor means.

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