# United States Patent

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**a corporation of Maine**


[54] **DUAL INVERTER FOR COUNTED STACKS OF SHEETS**
**12 Claims, 4 Drawing Figs.**


[52] **U.S. Cl.** ..... **214/1,** 198/33
[51] **Int. Cl.** ..... **B65g 69/00**
[50] **Field of Search** ..... 198/33R3, 33R4; 214/1R, 1A.B., 1, 310—314



[56] **References Cited**

UNITED STATES PATENTS

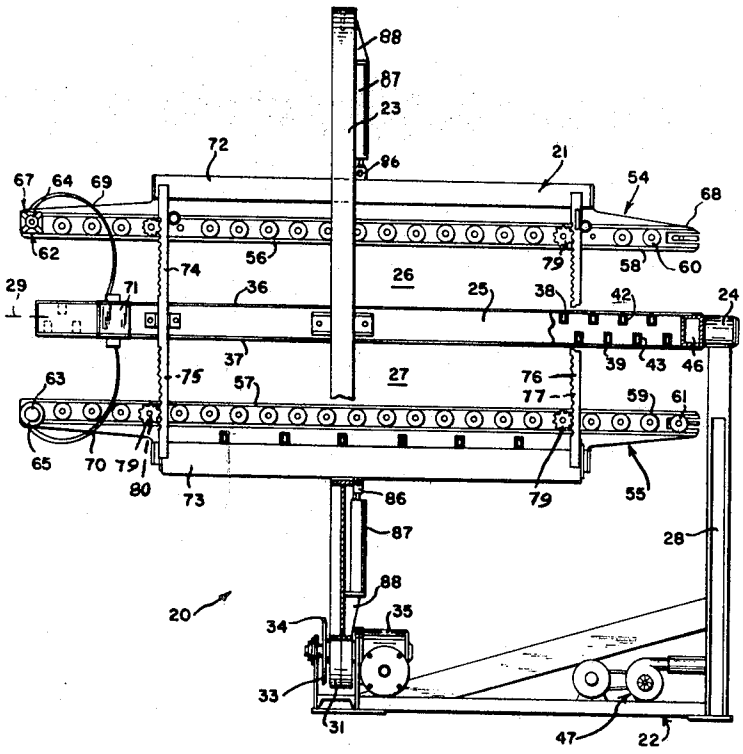
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|---|---|---|---|
| 1,677,290 | 7/1928 | Parker | 241/1(R)UX |
| 2,160,581 | 5/1939 | Behnke | 214/1(R)X |
| 2,277,310 | 3/1942 | Engelhart | 214/1(R)X |
| 2,774,487 | 12/1956 | Rounsefell et al. | 214/1(R) |
| 2,836,282 | 5/1958 | Rompre | 214/1(R)X |
| 2,984,364 | 5/1961 | Lamb | 214/1(R) |
| 3,367,517 | 2/1968 | Dallape et al. | 214/1(R) |
| 852,796 | 5/1907 | Moore | 214/52(B) |
| 2,226,068 | 12/1940 | Mosley et al. | 214/312 |
| 3,071,258 | 1/1963 | Seigh et al. | 214/1(R) |



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**ABSTRACT:** An inverter for sequentially inverting portions of stacked and counted piles of paper. A paper trimmer may thus be used to full load capacity with each trim, the inversion of each lift of untrimmed sheets, prior to trimming, retaining the count in the stack of trimmed sheets. The machine is so constructed that two knifeloads of paper can be stored in the same floor space as used for one knifeload in prior art devices. This result is accomplished by mounting two power actuated, movable clamping members each on an opposite side of a fixed central clamping member within a rotatable inverter frame. The lift-supporting faces of all members are flat, smooth and planar whether air cushion or belt. There is a paper-receiving passage between each movable clamping member and the fixed central member, an endless conveyor on one member in each passage, and the inverter is so operated that one lift of paper may be received in one passage at the same time another lift of paper is discharged from the other passage.

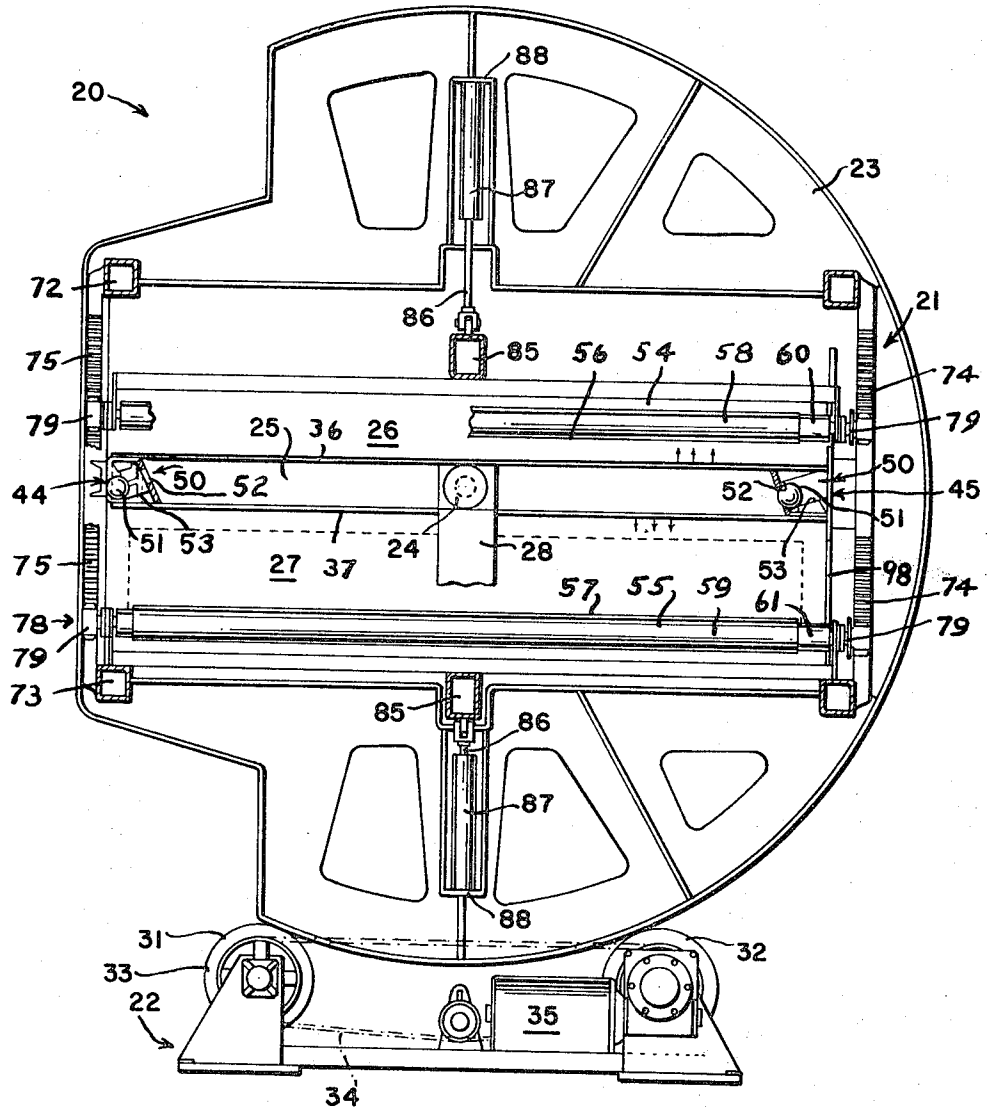



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SHEET 1 OF 2

Fig. 1



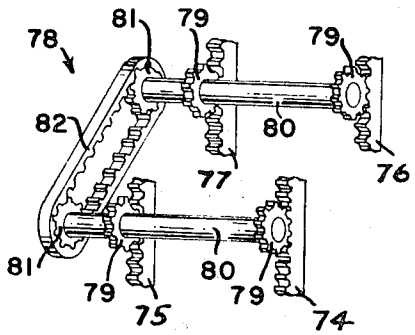
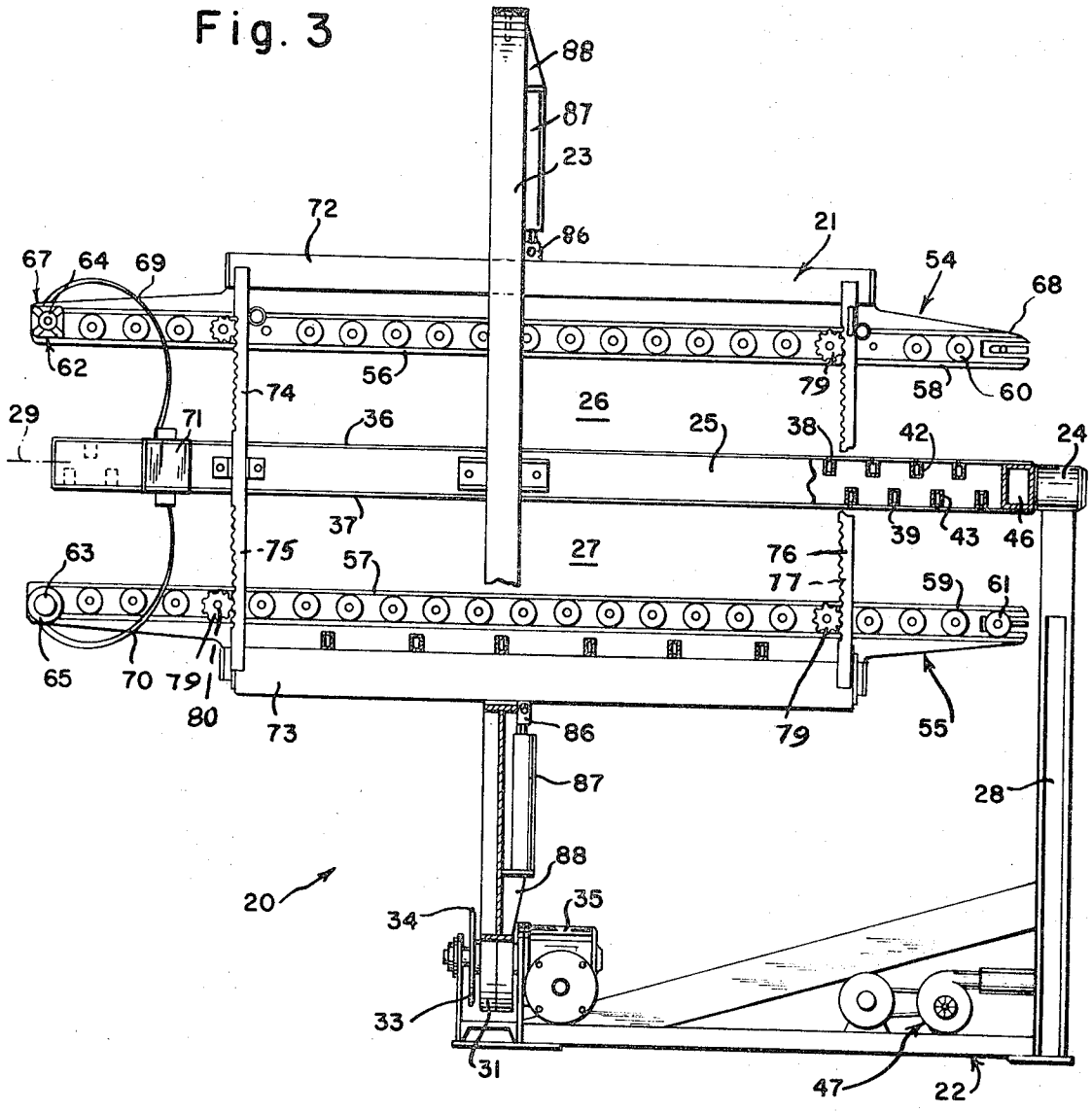




Fig. 2

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Fig. 3



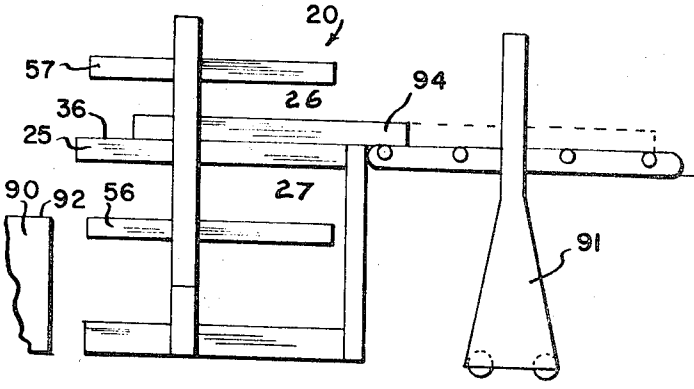
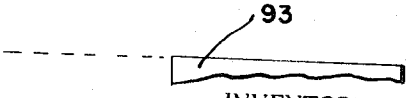




Fig. 4




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# DUAL INVERTER FOR COUNTED STACKS OF SHEETS

## BACKGROUND OF THE INVENTION

In processing paper and like material of a flimsy-sheet construction, it is often desired to further process paper which has been stacked and counted.

One such situation is when paper is to be unstacked by the ream, or lift, from a counted, marked stack before entering a paper-trimming apparatus. Heretofore, it has been necessary to unstack an increment of paper which is exactly equal to one ream, or multiple thereof, for example, a ream of 500 sheets, at a time, using tags at each 500th sheet as guides. In such a situation, considerable trimmer capacity is likely to go to waste. For example, suppose the guillotine trimmer has a 7 inch receiving section, i.e., is capable of handling a 7 inch thick stack of paper. Suppose further that a ream of the paper being handled is 2.5 inches thick. In these circumstances, the trimmer will only be loaded with two reams of paper because it is the largest number of full reams that can be put into the machine by using the visible guide tags. Thus only 5 inches of the 7 inch throat is utilized and nearly 30 percent of the true capacity of the machine is wasted.

When the inverter of this invention is used, a partial ream load, or lift, can be processed, because the first sheet of the next following load will be discharged from the inverter in a sequence immediately following the sheet which was adjacent to the first sheet in the original stacked and counted pile.

It is, of course, necessary to maintain the count, yet to do so with apparatus as inexpensive and simple to maintain as possible. When large sheets of paper are to be processed, it is particularly important that the apparatus be reasonably compact so that it takes as little floor space as is possible.

## SUMMARY OF THE INVENTION

Therefore it is an object of the invention to provide an improved inverter suitable for use in processing successive individual lifts of paper and like flimsy sheet materials.

It is another object of the invention to provide an inverter which has a high capacity per unit time and requires relatively little floor space.

Another object of the invention is to provide an inverter which tends to remove air entrapped between paper sheets and thereby further augment its capacity.

Other objects of the invention will be obvious to those skilled in the art on reading this application.

The above objects have been achieved by the construction of a novel inverter comprising an elongated inverter frame which is rotatably mounted for movement through an angular distance of 180° around a central longitudinal axis. A pair of elongated movable clamps are adapted for compressively holding a lift (or ream) of paper against a centrally positioned surface with side guides while inversion takes place. Preferably the central surface is an air table and the movable clamping members include endless conveyor belts for moving the reams into and out of the inverter.

However, in some embodiments of the invention, the centrally positioned clamping surface can be a dual-faced conveying surface (for example an endless belt adapted for two-way operation) and the air surface can be on the paper-contacting face of the movable, paper-positioning, clamping members.

FIG. 1 is an end elevation, partly in section, of the inverter of the invention.

FIG. 2 is a diagrammatic view, on a reduced scale, showing the stabilizer means.

FIG. 3 is a side elevation, partly in section, of the inverter shown in FIG. 1, and

FIG. 4 is a diagrammatic view on a reduced scale of a trimmer assembly incorporating the inverter of the invention.

As shown in the drawings, the inverter **20** of the invention includes an elongated frame **21**, supported for turning through an angle of 180° on a base **22** by the single, partly circular wheel **23** and the central hollow bearing **24**.



Inverters of the prior art have usually had a pair of wheels, such as **23**, so that there is no bearing, or other obstruction, at the center of the opposite ends, this being the location of the single, central load-receiving passage.

However, in the inverter **20** this invention, there is an elongated, dual-faced, table **25**, fixed along the central longitudinal axis **29** of the frame **21**, which forms a pair of load-receiving passages **26** and **27**, each on an opposite side of the axis. It is thus possible to eliminate one of the conventional wheels and rely on a single wheel **23**, plus the upstanding base member **28** in which the hollow bearing **24** is journalled for rotation. It will be obvious that two wheels can be used if desired.

The wheel **23** is rotatably supported in a pair of friction rolls **31** and **32**, the rolls being driven by sprockets **33** and chain **34** from a reversible motor and reducer **35** in a known manner, so that the wheel and frame are turnable through a half circle.

Preferably the fixed table **25** is of the air flotation type with opposite upper and lower lift support faces **36** and **37**, each having a multiplicity of air apertures, **38** or **39**, fed by transverse hollow conduits **42** or **43**. The hollow conduits **42** and **43** are each connected to one of the opposite ends **44** or **45** of a plenum **46**, the plenum being connected centrally through hollow bearing **24** and hollow upright **28** to a source of air under pressure, such as the air pressure blower **47**, carried on base **22**, or to mill air supply.

Valve means **50** in the form of a ball **51**, valve seat **52** and inclined ball track **53** are provided in each end **44** or **45**, of plenum **46** so that the ball **51** will roll down the track **53** by gravity to close seat **52** and shut off air to the apertures of the lower face each time the inverter frame is turned. Thus full air pressure is emitted from the upper face air outlets **38**, to air float a lift being received on the then upper lift support face **36** or **37** and no pressure is lost through the lower air outlets, not then being used.

A pair of elongated movable clamps, or jaws, are mounted in inverter frame **21**, each clamp **54** or **55** having a paper-positioning surface **56** or **57** substantially coextensive in area with, and in parallelism with, the adjacent face **36** or **37** of the fixed air flotation table **25**. Preferably, each surface **56** or **57** is a conveyor surface formed by an endless belt such as **58** or **59**, trained over a multiplicity of belt-carrying rolls **60** or **61**, the end rolls **62** or **63** of each set being crowned to prevent side creep of the belt and being a drive roll, rotated by one of the drive motors **64** or **65**. It will be noted that no tracks rollers, pallets or trays are used in the inverter **20** of the invention, the lift of counted sheets being contacted and supported only by the flat, smooth, planar, lift support faces **36**, **37**, **56** and **57**, to avoid damage or marking of limp lift of limp sheets.

The drive motors **64** and **65** are preferably reversible and it will be seen that the dual passages, or zones, **26** and **27**, are each thus defined by a fixed, inner, air flotation face **36** or **37** and a movable, outer, power belt, conveyor surface **56** or **57**, all en extending from one end **67** to the other end **68** of the frame **21**. Flexible conduits **69** and **70** connect motors **64** and **65** to fixed table **25** for connection to the control system **71** of the inverter.

The frame **21** is skeletonized and consists, in general, of the upper rectangular, horizontal frame **72**, the lower horizontal frame **73**, and the central table **25**, these all being fixed and immovable relative to wheel **23**. A pair of upstanding frame pieces **74** and **75** fixedly connect one end **67** of the frame and a second pair of upstanding frame pieces **76** and **77** fixedly connect the other end **68** of the frame, these frame pieces **74**, **75**, **76** and **77** being gear racks.

Two-way stabilizer means **78** (FIG. 2) is provided in the form of pinion gears **79** on each opposite side of each end of each movable clamp, which gears are enmeshed in their respective gear racks. The gears **79** on each opposite side are each fast to a transverse shaft **80**, and the shafts at each end of each clamp carry sprockets **81** connected by a longitudinally extending chain **82**. Thus the clamp members remain in parallelism and cannot tilt as they move toward and away from the adjacent face of the fixed table **25**.

Each clamp member, or movable jaw, **54** or **55** includes a longitudinally extending brace **85** centrally thereof, the brace being connected to a piston rod **86**, of a fluid pressure cylinder **87**, the cylinder being fast to a suitable bracket **88** on wheel **23**. The clamp moving, or actuation, means **86** and **87** is powered from a suitable pressure source, or mill supply, and controlled by the control system **71** of the invention.

It will be understood that the surfaces **56** and **57** of the movable clamps **54** and **55** could be air flotation surfaces if desired, and that the faces **36** and **37** of the table **25** could be formed by the upper and lower stretches of an endless driven conveyor belt if desired.

In operation, as best shown in FIG. **4**, the inverter **20** may be located between a guillotine trimmer **90** and a movable unstacker **91** of a well-known type, the upper face **36** of table **25** being at the level of the air table of the unstacker for loading. The level of each successive lower conveyor face **56** or **57** is at the level of the deck **92** of the trimmer, so that a lift of paper in the lower passage **27** may be discharged by the belt onto the deck. The unstacker **91**, in a known manner, penetrates into a counted stack **93**, to segregate successive topmost lifts, or reams, such as **94**, draw the lift onto the unstacker, move to the inverter **20** and roll convey the lift onto the upper air flotation surface **36** in upper passage **26**. The control system **71** then causes the inverter to turn sufficiently to slide the lift sidewise against the vertical flat bars **98** serving as side guides to keep the edges of the sheets aligned, whereupon the clamp **54** or **55** closes to hold the lift tightly during the remainder of the 180° turn. Suitable limit switches and photo cells cause the inverter to halt, the clamp **54** to open to the level of the trimmer deck, and the conveyor belt to discharge the lift onto the deck. Meanwhile another lift is being advanced into the then upper passage, so that the inverter **20** is always handling two lifts in the floor space required by one lift.

Regardless of the number of sheets in each lift, and preferably this will be the maximum number capable of being handled in the trimmer, the count of the stack is not lost, because each lift is being inverted prior to being trimmed for restacking in the exact sheet order of the original untrimmed stack. The final trimmed and reassembled pile, or stack, will be inverted from the original, but the count will have been retained.

I claim:

**1.** In an inverter suitable for the sequential inverting of lifts of paper and of the type comprising paper-receiving means in a frame rotatably mounted on a central longitudinal axis for back and forth motion through a 180° angle, the improvement consisting of:

a dual-faced, back to back centrally located air table fixed in said frame, each said face being flat, smooth and planar to support a lift and including a plurality of air supply outlets for air cushion support of said lift;

two paper-positioning clamps, each mounted within said frame and each mounted opposite one face of said table, for clamping movement toward and away from said face, said clamps each including a flat, smooth, planar, conveyor belt, lift-clamping surface and powered actuating means for reciprocal moving said lift-clamping conveyor belt surface towards and away from a face of said table thereby forming means to firmly clamp and release a lift of paper therebetween;

two axially extending through passages in said frame, each defined by one said clamping surface of a paper-positioning clamp and the adjacent lift-supporting face of said dual-faced table; and

power means, operably connected to each said conveyor belt surface on said clamps for moving a lift axially through one of said zones.

**2.** The inverter of claim **1** wherein each said power driven conveying surface consists of series of rolls, an end roll of the series being a crowned drive roll, and an endless belt trained therearound.

**3.** The inverter of claim **1** wherein said air table includes gravity actuated valve means for carrying air from an air supply source to the outlets in the face of said air table which is facing upwardly.

**4.** The inverter of claim **1** plus two-way stabilizer means on each said clamp, said means including gear racks at each end of said clamps on each opposite side thereof, and gears intermeshed therein for preventing lateral, or longitudinal, tilt of said clamps.

**5.** In an inverter of the type having an elongated frame turnable on a central longitudinal axis through an angular distance of 180° on a base, the combination of:

an elongated table located centrally in said frame along said axis, said table having a pair of back to back opposite axially extending flat, smooth, planar lift support faces thereon;

a pair of elongated clamps, each having a flat, smooth, planar lift support face extending in parallelism with one of said table faces at a spaced distance therefrom, to form a pair of axially extending through passages in said frame, each on an opposite side of said axis and extending from end to end of said frame, one lift support face in each said passage being mounted for movement toward and away from the other lift support face therein;

power means for moving the movable support faces toward and away from the other support faces therein to clamp a lift of flimsy paper sheets therebetween; and at least one said support face in each said passage being formed by an endless belt power conveyor means for moving a lift of paper longitudinally therealong.

**6.** An inverter as specified in claim **5**, wherein:

a said frame includes a single, centrally located, partly circular, wheel turnable in a pair of rolls in the inverter base;

a hollow bearing, at the center of one end of said fixed table journalled on said base, and

said table is an air cushion table supplied with pressurized air through said hollow bearing.

**7.** An inverter as specified in claim **5**, wherein each said lift support face of said table includes air apertures, said table constitutes a plenum connecting said apertures to a source of air pressure and said plenum includes automatic, gravity actuated valve means disconnecting air from the apertures on each successive bottom-most lift support face.

**8.** An inverter as specified in claim **5**, wherein:

said table is an air table connected to a source of air, and having air outlets in said faces;

each said clamp includes said endless belt power conveyor means forming the lift support surface thereof; and

whereby a lift may be slid into the upper said passage on an air cushion surface of said fixed table, clamped, turned and unclamped by said inverter, and conveyed out of said passage on the conveyor means of the lift support face forming said passage.

**9.** An inverter as specified in claim **5**, wherein:

each opposite end of said movable lift support face is positively connected by intermeshed gear and gear rack stabilizer means to the other end of the movable lift support face of the said clamp on each opposite side thereof; and

whereby both lateral and longitudinal stability of said movable clamps is assured.

**10.** An inverter for interposition between an unstacker and a paper trimmer deck, for receiving successive lifts of counted sheets, inverting each lift through 180°, and is discharging the same onto the deck of said trimmer:

said inverter including a rotatable frame having a pair of back to back opposite axially extending, centrally, fixed, air, flotation faced inner jaws, each opposed by one of a pair of outer, axially extending, movable, conveyor belt surfaced clamp jaws, the surface of all of said jaws being flat, smooth and planar to support said lifts;

means mounting belts surfaced clamp jaw for movement toward and away from the fixed jaws;

one said air flotation faced jaw being adapted to slidably receive a lift of counted sheets at one predetermined level while one said belt-surfaced clamp jaw is in position to

discharge the previous lift onto said trimmer deck at another, different, predetermined level.

11. An inverter for counted, marked lifts of paper sheets, said inverter comprising:

an elongated inverter frame, rotatably mounted on a base, for turning a longitudinal axis through an angular distance of at least 180°;

an air table fixed centrally and diametrically of said frame, said table having a pair of back to back oppositely disposed, flat, smooth, planar air flotation faces, each on an opposite side of axis;

a pair of movable lift-positioning clamp jaws each mounted on said frame opposite one of said air flotation faces for movement toward and away therefrom and each having a flat, smooth, planar conveyor belt face in general parallelism therewith for mutually defining one of a pair of longitudinally axially extending passages in said frame;

power means for moving said lift-positioning clamp jaws toward and away from the air flotation faces of said table to clamp a lift therebetween for turning; and

power means for turning said frame on said axis to invert each successive lift enclosed in one of said passages and

power means for moving said conveyor belt faces to move an unclamped lift axially through said inverter.

12. In an inverter of the type having an elongated frame turnable on a central longitudinal axis through an angular distance of 180° on a base, the combination of:

an elongated table located in said frame along said axis, said table having a pair of back to back opposite flat, smooth, planar lift support faces thereon;

a pair of elongated clamps, each having a flat, smooth, planar lift support face extending in parallelism with one of said table faces at a spaced distance therefrom, and opposed thereto, to form a pair of axially extending through passages in said frame, each on an opposite side of said axis and extending from end to end of said frame;

at least one lift support face in each said passage being fixed and the other being movable toward and away therefrom;

power means for moving the movable support face toward and away from the fixed support face, in each said passage, to clamp a lift of flimsy paper sheets therebetween; and

power endless belt conveyor means forming at least one of said opposed flat, smooth, planar support faces in each passage for moving a lift of paper longitudinally therealong.