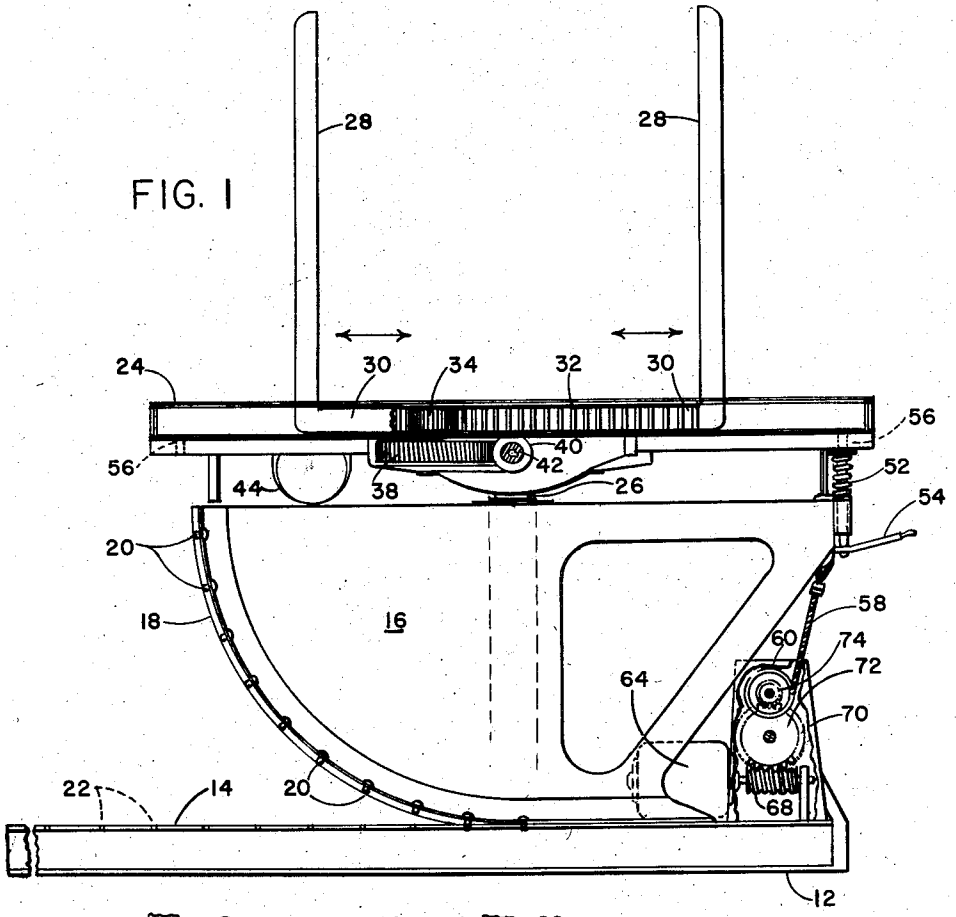
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INVERTING MECHANISMS

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FIG. 1



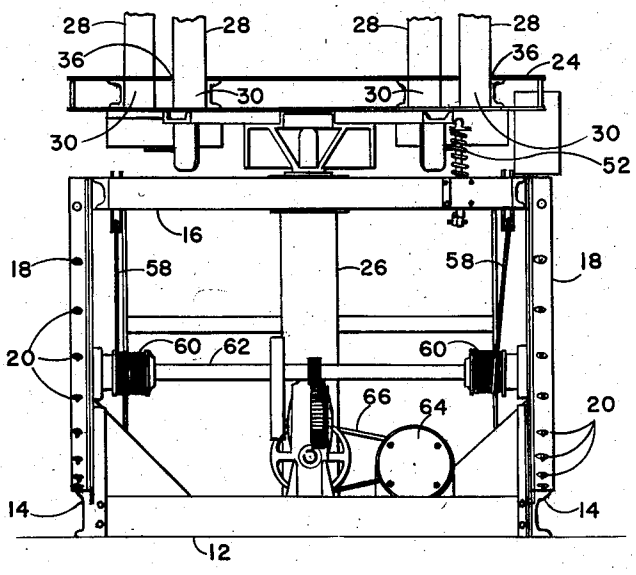


FIG. 2

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FIG. 3

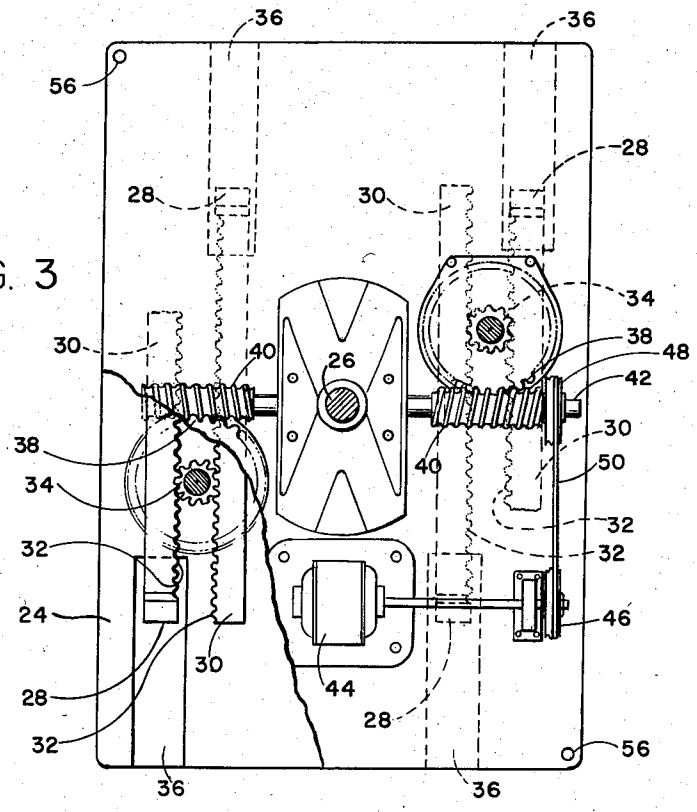
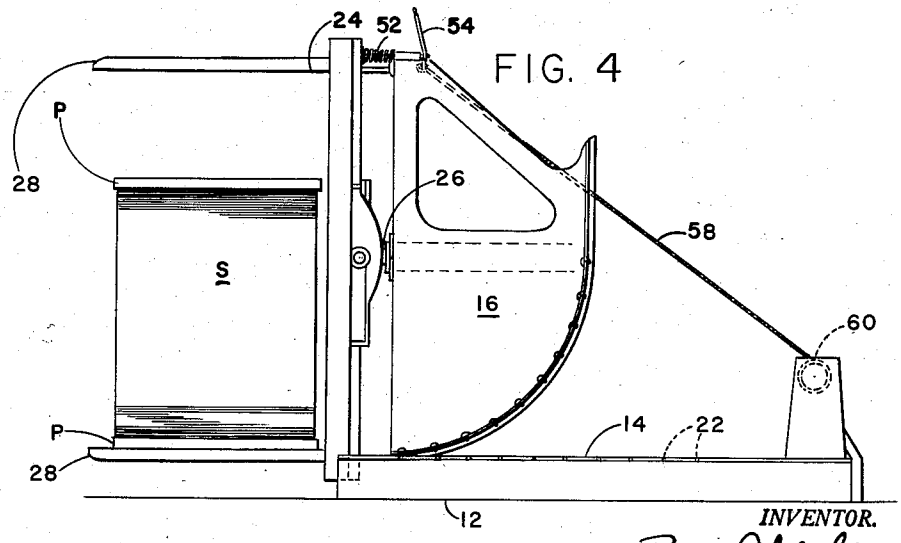


FIG. 4



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2,862,629

INVERTING MECHANISMS

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Application February 5, 1954, Serial No. 408,421

1 Claim. (Cl. 214—1)

This invention relates to material handling equipment and more particularly to a novel inverting mechanism for inverting stacked sheet material such as paper and the like.

Heretofore, in the printing of large numbers of sheets of paper on both sides, it has been necessary after printing on one side to turn over by hand relatively small groups of sheets in the printed automatically piled stack of such sheets in order to print on the opposite side. This was a tedious, time consuming, and inefficient operation, particularly in the case of sheets of paper of large dimensions, say of the order of two feet wide by three feet long, in which each group of say five or ten sheets of a stack of perhaps several thousand sheets of paper had to be individually turned over by hand.

The problem of preventing damage was especially serious in specialty printing industries involving relatively expensive high quality multi-color printing operations. In the greeting card industry, for example, the turning over of each individual small group of sheets after printing so that each sheet could be printed on its opposite side was almost invariably necessary, and the labor involved represented a substantial item of operating expense out of line with the otherwise automatic feeding, printing, and stacking operation. Furthermore, even the turning over by hand of the once printed sheets was itself a source of damage, and the damage so caused represented a further substantial operating expense.

Accordingly, to deal with these problems which have long been considered a necessary evil in the printing industry, I have provided a novel inverting mechanism for inverting bodily a stack of paper or the like by which I am enabled quickly and easily to invert a stack of several thousand sheets of paper of large dimensions, so that it is no longer necessary individually to turn over the paper by hand.

It is a feature of my novel mechanism that it practically eliminates the damage to the printed sheets of paper caused by turning them over.

For the purpose of describing still further features of a preferred embodiment of my novel inverting mechanism, reference is made to the following detailed description thereof, together with the accompanying drawings, in which:

Fig. 1 is a side elevational view, partly broken away, of the novel inverting mechanism of my invention in a raised position;

Fig. 2 is an en elevational view of the mechanism of Fig. 1;

Fig. 3 is a sectional plan view, partly broken away, of the mechanism of Fig. 1; and

Fig. 4 is a somewhat diagrammatic side elevational view of the mechanism of Fig. 1 in a lowered position.

Referring to the drawings, the inverting mechanism of my invention includes a lower frame **12** having a pair of spaced, generally horizontal fixed track members **14**. Mounted on said track members for rolling movement therealong is provided a rolling frame **16** having a pair

of generally quadrantal rolling members **18** adapted to roll along said track members. The rolling members **18** are preferably provided with peripheral studs **20** adapted to engage sockets **22** in said track members **14** to eliminate slippage between the rolling members **18** and the track members **14**.

A supporting clamp structure for supporting a stack of paper or the like to be inverted is mounted on the rolling frame **16** for rotation about an axis generally perpendicular to the rolling axis of said frame **16**, said structure including plate member **24** fixed on a shaft **26** rotatably mounted on rolling frame **16**, said shaft being perpendicular to the rolling axis of frame **16** and generally parallel to the radial lines defining the rearward end of the quadrantal rolling frame members **18**. Plate member **24** is provided with two pairs of opposed clamps at opposite sides thereof, said clamps being slideably mounted at the rear of said plate member for movement toward and away from one another in a direction perpendicular to the rolling axis of said rolling frame **16**. Each of said clamps comprises a generally L-shaped member having its clamping portion **28** extending generally perpendicular to the flat working face of plate member **24** with its operating portion **30** at a right angle thereto slideably mounted behind said plate and having a rack portion **32** engaging a pinion **34** rotatably mounted on the rear of said plate, each pair of said clamps being operated by said pinion with their opposed rack portions **32** engaging opposite sides thereof so that rotation of said pinion will simultaneously move said clamping portions **28** toward one another to clamp a load generally centrally of plate member **24**, suitable slots **36** being provided in the working face of plate member **24** for free movement of the clamping portion **28** of said clamps.

Each of the pinions **34** is power operated by a worm wheel **38** mounted on plate member **24** for rotation with pinions **34**, each of said worm wheels **38** being operated by a worm **40** mounted on a common worm shaft **42** rotatably supported on plate member **24** for driving both of said worms. The worm shaft **42** is driven by a motor **44** through a pulley **46** mounted on said motor shaft and driving a pulley **48** mounted on the worm shaft **42** through a belt **50**, said motor preferably including an overload coupling mechanism which will permit slippage when maximum clamping force is applied to maintain the clamps resiliently against the stack of paper clamped therebetween. A spring lock device **52** may be provided on rolling frame **16** to lock plate member **24** in a selected rotary position, said spring lock device being operated by a handle **54** to selectively engage one of the sockets **56** at opposite diagonal corners of plate member **24**.

To provide for movement of the plate member **24** between a horizontal and a vertical position by moving the axis of shaft **26** from its raised vertical position as shown in Fig. 1 to its lowered horizontal position as shown in Fig. 4, as well as the reverse, I have provided mounted on fixed tracks **14** and lower frame **12** a winch mechanism including a pair of operating cables **58** attached to the rearward end of rolling frame **16** at opposite sides thereof, said cables being wound up on drums **60** on a common shaft **62** mounted in suitable bearings at the rear of lower frame **12**, said cables thus in effect extending between rolling frame members **18** and fixed track members **14**. The shaft **62** is driven through its pinion **74** by a reversible motor **64** through a belt **66** and speed reduction gearing comprising a worm **68** and worm wheel **70**, said worm wheel having a pinion **72** which drives said pinion **74**.

With such cable drive arrangement, it is essential that the center of gravity of the rolling frame supporting clamp structure including a load thereon be somewhat displaced

from the rolling axis of frame **16** in a direction generally forwardly toward the direction of lowering movement of the plate member **24**, and hence opposed in direction to the pull of cables **58** so that the rolling movement of said rolling frame **16** can be controlled by said cables through their operating motor **64**.

In operation, the rolling frame **16** is first moved to a lowered position by operating motor **64** to unwind cables **58** from their drums **60** until shaft **26** is in a generally horizontal lowered position, plate member **24** then being vertical with its forward end thereof adjacent the forward ends of track members **18**, and with the clamping portions **28** of the clamps generally horizontal. Said clamps are then simultaneously opened to their fullest extent by rotating pinions **34** and a stack of paper S on a suitable pallet member P is then placed upon the lowermost clamps of each pair of clamps. A second pallet P is then placed on top of the stack of paper S and the clamps are again operated by their motor **44** to close said clamps and clamp the stack of paper S with its pallets P therebetween generally centrally of plate member **24**.

The cable motor **64** is then operated to wind up cables **58** on their drums **60** and to roll frame members **18** along track members **14** until plate member **24** has been raised to a substantially horizontal position parallel to and above said track members **14**, as shown in Fig. 1, with its shaft **26** generally vertical. Spring lock **52** is then released from socket **56** and plate member **24** rotated through 180° to invert bodily said stack of paper S and there again locked by spring lock **52** in the diagonally opposite socket **56**. Plate member **24** may then be lowered by operating motor **64** to unwind cables **58** from their drums **60** as before until said frame members **18** have rolled along track members **14** so that plate member **24** is again in a substantially vertical lowered position. The clamps may then be opened and the inverted stack of paper S between pallets P removed therefrom, the mechanism then being ready to receive another stack of paper to be turned over.

Thus it will be seen that I have provided a relatively simple and effective inverting mechanism particularly useful for inverting sheet material such as, for example, paper, sheet metal, plastic, and the like, by which mechanism a stack of several thousand sheets of material of large dimensions may be quickly and easily inverted bodily without damage thereto, it being understood that my novel mechanism may readily be used for inverting still other types of material. It will be apparent to those skilled in this art that various modifications of my novel

mechanism may be made within the spirit of the invention and the scope of the appended claim.

I claim:

An inverting mechanism including generally horizontal fixed track means, a generally quadrantal rolling frame mounted for rolling movement along said track means, supporting clamp means mounted on said frame for rotation about an axis generally perpendicular to the rolling axis of said frame, said supporting clamp means including a plate lying in a plane generally perpendicular to the axis of rotation of said supporting clamp means, means for positioning and locking said plate in only either of two selected rotary positions 180 degrees from one another, said positioning means including sockets positioned in opposite diagonal corners of said plate and a spring-urged pin mounted on said frame, and opposed clamps mounted on said plate, said clamps extending generally perpendicularly to the face of said plate and being movable toward and away from one another in a direction perpendicular to the rolling axis of said frame with said plate in either of said selected rotary positions, means for moving each said opposed clamp toward and away from one another to clamp a stack of material therebetween including opposed racks on each of said opposed clamps mounted for sliding movement on said plate means with said clamps, a pinion rotatably mounted on said plate between and engaging said opposed racks for simultaneously moving said racks, and power means mounted on said plate for driving said pinion, and means for rolling said frame along said track means to move said plate between a lowered horizontal position with one end thereof adjacent said track means and a raised vertical position generally parallel to and above said track means, said means for rolling said frame including cable means extending between said rolling frame and said fixed track means, and winch means for winding up and unwinding said cable.

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