Feb. 11, 1969 C. H. T. WOODWARD 3,426,927

MOVABLE PLATFORM WITH LIFT AND TURNOVER MECHANISM

Filed Feb. 12, 1968 Sheet 1 of 4

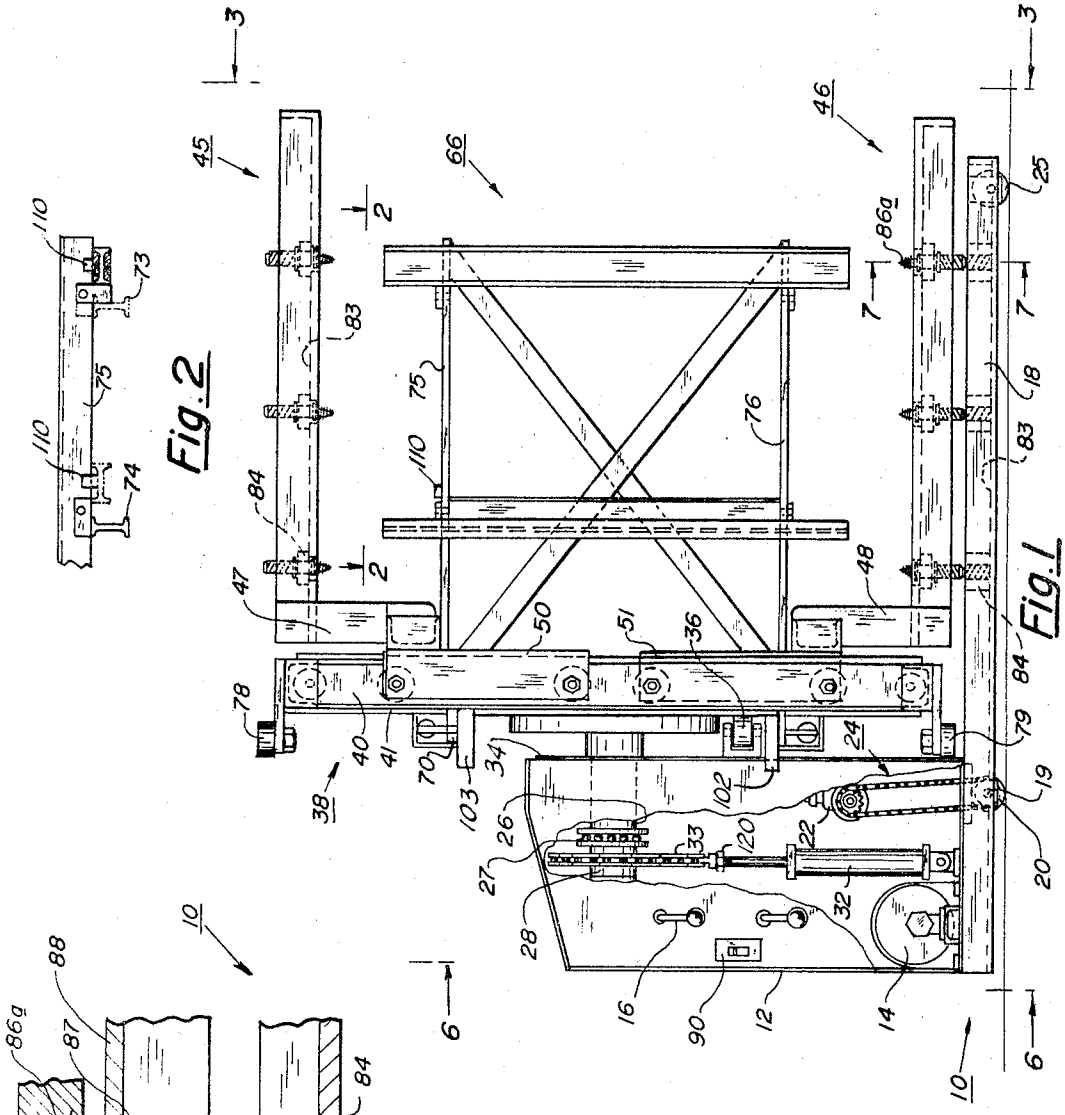


Fig. 1

Fig. 2

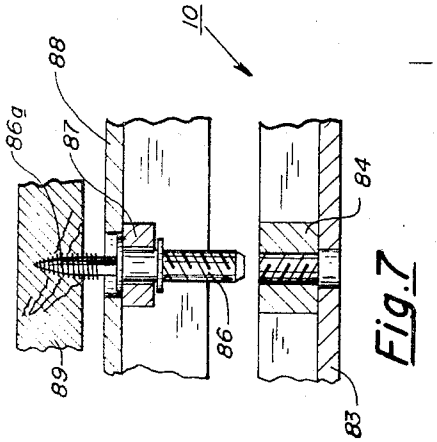


Fig. 7

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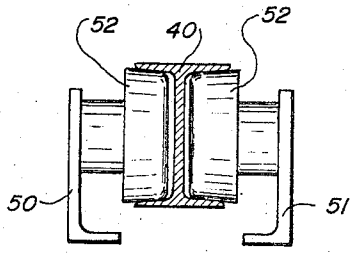


Fig. 5

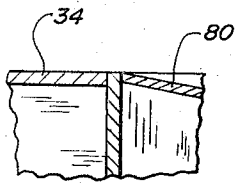


Fig. 4

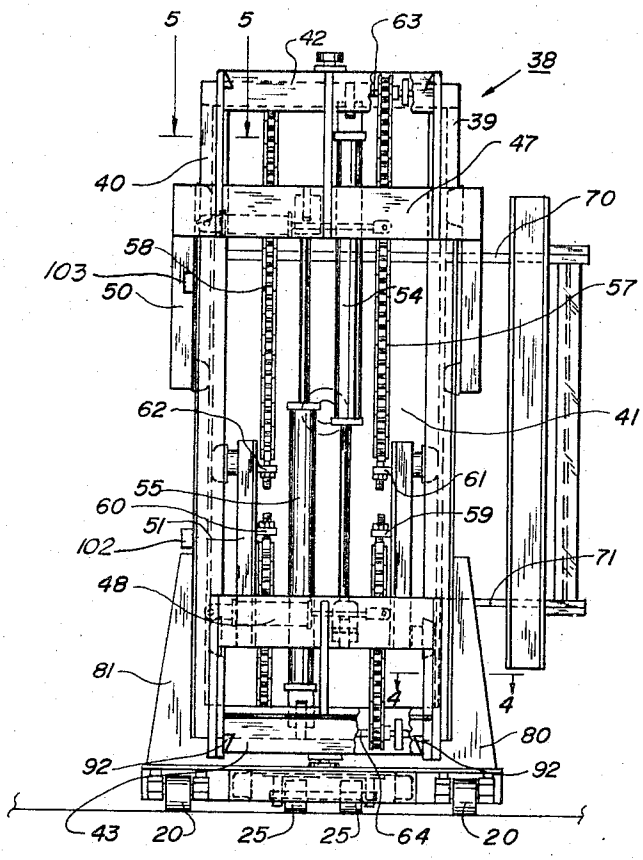


Fig. 3

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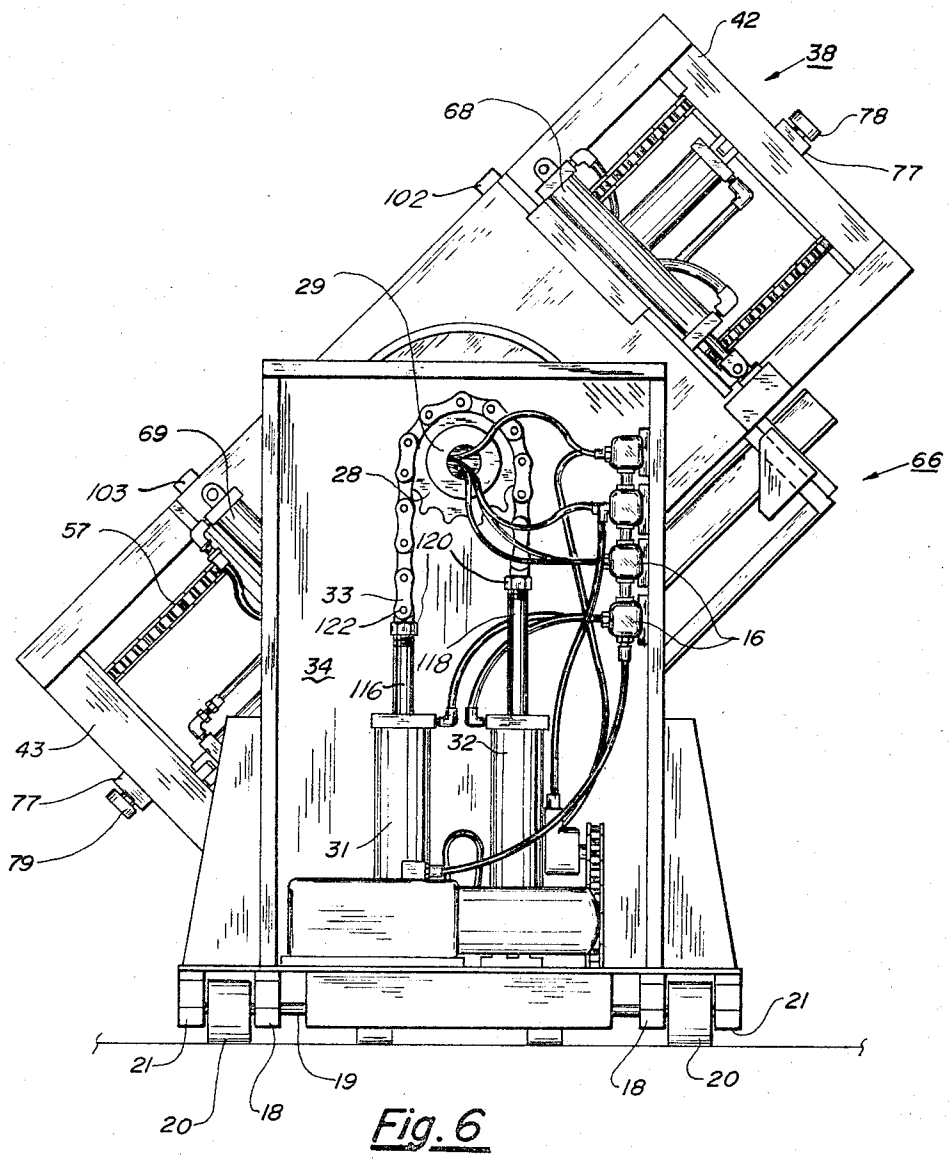


Fig. 6

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MOVABLE PLATFORM WITH LIFT AND TURNOVER MECHANISM

Filed Feb. 12, 1968 Sheet 4 of 4

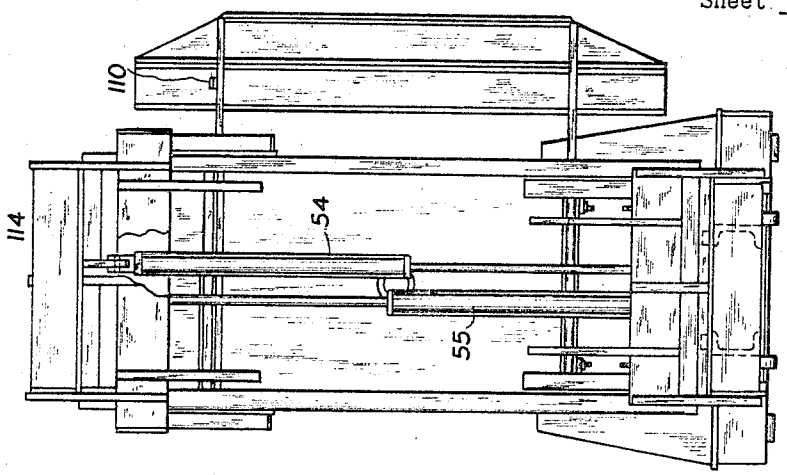


Fig. 9

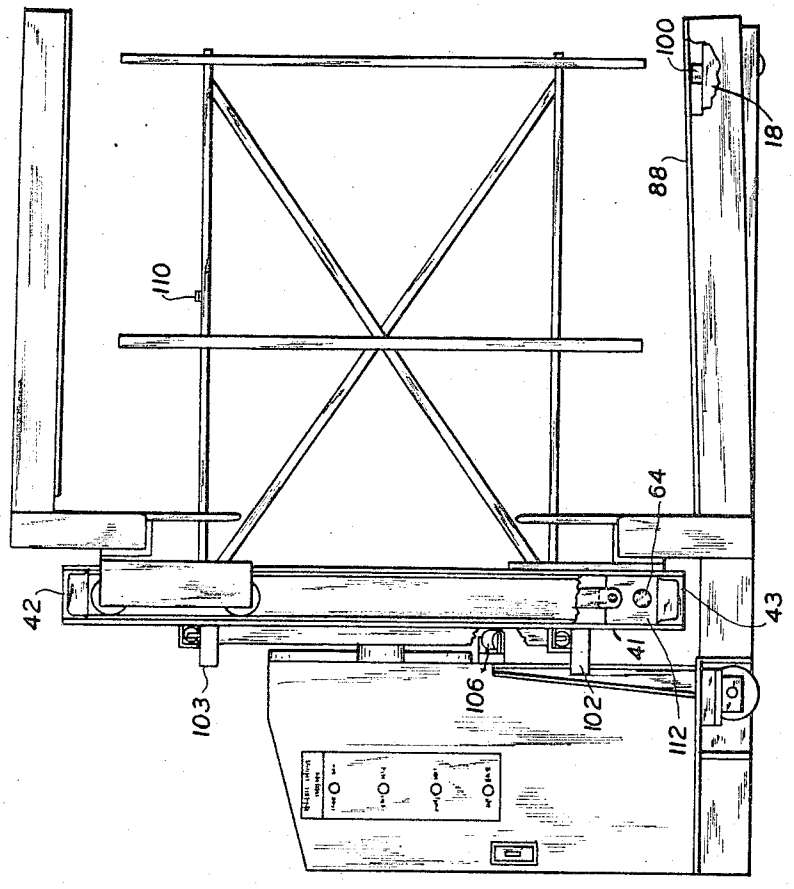


Fig. 8

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3,426,927

MOVABLE PLATFORM WITH LIFT AND TURNOVER MECHANISM

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Continuation-in-part of application Ser. No. 551,096, May 18, 1966. This application Feb. 12, 1968, Ser. No. 709,526
U.S. Cl. 214—652 12 Claims
Int. Cl. B66f 9/18; B65g 7/00

ABSTRACT OF THE DISCLOSURE

A skid inverter for turning skids of paper and the like in which are provided selected limits of rotation of the turnover mechanism. The rotation is provided by a pair of hydraulic cylinders whose piston rod ends are connected by a roller chain. These connections are adjustable on the rods to compensate for stretch in the chain and to provide adjustment between the stroke of the cylinders and the driving sprocket. The inverter is further provided with cooperating means between the movable platforms and the support frame to provide an aligning means as the movable platforms are moved to an open position. With the aligning means in engagement the movable platform is retained in a precise position absent a turnover force. The skid inverter additionally has easily manipulated adjusting members readily movable to provide limits for both wide and narrow skid loads. The movable platforms are additionally provided with a plurality of auger screw type skid engaging means adapted to hold the skid to the top movable platform as it is moved to the open position.

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of my application Ser. No. 551,096 filed May 18, 1966, and now abandoned.

BACKGROUND OF THE INVENTION

Field of the invention

The field of art to which this invention pertains is found in the class of Material or Article Handling and more particularly in the subclasses wherein there is a "vertically swinging load support," "shovel or fork type," "horizontal swinging," and also in the subclass for "self-loading and/or unloading elevator, hoist type" in particular that subclass pertaining to "grab," "movable about a horizontal axis" and to the subclass of "tilting carrier" and those that are "selective."

Description of the prior art

The widespread use of the mobile skid turner as shown and described in my U.S. Patent No. 3,027,031 issued Mar. 27, 1962 has indicated the utility of this type of apparatus. As the commercial use has increased so also has the demands by the customers for still greater capacities and ease of operation for handling larger and heavier loads, sizes, as well as manipulative abilities not contemplated in the apparatus of the original invention.

The extending of the skid turner to accommodate still greater capacities has required that certain manipulative operations be provided with substantially automatic actuations. For example, in the turning of the loads it is desired that the skid turning mechanism be provided with positive stops so as to orient the movable members in precisely vertical positions. It is also found desirable that there be provided an automatic orienting member whereby when the movable clamp members are opened

to their extreme outer positions and the power to the turning mechanism is turned off that the clamp members are maintained in a positive alignment in the support frame, while the skids are loaded and unloaded into the skid turner.

In addition it is desirable that the skid turner readily adjust to extremes of load widths. The skid turner to be hereinafter shown and described is provided with readily adjustable side stops so that particularly narrow loads may be accommodated on apparatus customarily used for particularly wide loads and vice versa.

It is further contemplated that the skid turner shown and described hereinafter have its clamping members have skid attaching means providing a one-man operation whereby the wooden skids supporting the paper and the like when turned to an upper position are retained on the upper movable platform member.

SUMMARY OF THE INVENTION

In accordance with the improvements to the skid turner of this invention it is contemplated that the turnover apparatus of the skid turner be provided with stop members positioned to engage selected portions of the support housing to provide a maximum extent of the turning of the skid to each of two determined positions. These positive stops eliminate the consequences of over travel of the turnover mechanism. The power train for turning the clamping mechanism includes a pair of hydraulic cylinders which are adjustably attached to a roller chain. In this precise adjusting means the ends of the hydraulic cylinder piston rods are threaded to retain roller chain attaching link members by which the chain may be shifted in respect to the pistons to shift the timing of the sprocket to the pistons which power the turnover mechanism.

The improved skid turner has its side adjusting members provided with at least two pivotal members carried by the extending members forming a part of the side adjusting frame. The pivoted members are selectively turned to one of two positions which are ninety degrees from each other to provide two limits for the engagement, the side adjusting member and the side of the skid load. The pivotal members of the side adjusting means are thus moved to accommodate loads greater than and less than the width of the turnover frame. The pivoted members are retained in one of the two selected positions by means of latch or hook disposed to retain the pivoted member in each of the extreme positions.

It is further contemplated that each of the movable platforms may have a plurality of rotatably retained threaded screws arranged in a preselected precisely positioned pattern so as to engage a like plurality of threaded nuts or bosses provided in the support frame. Each of the movable platforms so formed as they are brought towards the support frame bring the threaded ends of the screws to and into the threaded nuts where the threads are engaged and turned by the like threads of the nut in the platform. The inwardly extending skid engaging portion of the screw has a fast pitched thread similar to an auger thread, which thread is adapted to engage and advance into the wood of the skid to urge the wood skid against the movable platform and retain the skid against the movable platform as the platform is turned to its upper position.

It is an object of this invention to provide a skid inverter in which are provided means on the turnover frame for positively aligning and maintaining said frame in a fixed vertical position during the open skid receiving condition and absent power, the aligning means being disengaged as the load is engaged and lifted from the base support. It is also an object to provide easy manipu-

lative adjusting means to provide a side guide readily adapted to be moved to two determined limits so that the guide will accommodate both wide and narrow skid loads.

It is a further object of this invention to provide a skid inverter in which means are provided in both movable platforms to engage and retain a skid on each platform surface so that as the skid is turned and as the platforms are moved to the open position the skid which is then on the top position is retained against that platform.

It is a further object of this invention to provide a skid inverter in which the axis of rotation is predeterminedly fixed and in which a turnover frame is rotatable through one hundred-eighty degrees of rotation by means of opposed hydraulic cylinders connected by a roller chain, said chain connected to the threaded ends of the piston rods so as to provide minute timing of the rotation.

It is a further object of this invention to provide a skid inverter wherein the turnover frame is provided with stops positioned so as to engage the support frame to provide precise limits of rotation.

It is a further object of this invention to provide a skid inverter wherein the turnover frame is provided with a power system for moving the platforms toward and away from each other. This power system includes a pair of hydraulic cylinders, each of which is supported on one end by means of a support block attached to an end of the frame.

INTENT OF THE DISCLOSURE

Although the following disclosure offered for public dissemination is detailed to insure adequacy and aid in understanding the invention, this is not intended to prejudice that purpose of a patent which is to cover each new inventive concept therein no matter how it may later be disguised by variations in form or additions of further improvements. The claims at the end hereof are intended as the chief aid toward this purpose, as it is these that meet the requirement of pointing out the parts, improvements and combinations in which the inventive concepts are found.

There has been chosen a specific embodiment of the skid turner mechanism as is shown in my U.S. Patent No. 3,027,031. The specific improvements to this skid turner have been chosen for the purpose of illustration and description. The preferred embodiment encompassing these improvements are shown in the accompanying drawings wherein:

FIG. 1 represents a side view of the skid inverter of this invention in one arrangement thereof, and with portions of the wall of the control cabinet broken away to show the arrangement of the turning apparatus;

FIG. 2 represents a fragmentary plan view on the line **2–2** of FIG. 1 and showing the side adjusting frame provided with pivotally attached extending members for movement to selected positions adapted to engage extremes of different size skid loads;

FIG. 3 represents a front view of the skid inverter of this invention as viewed when looking in the direction of the arrows **3–3** of FIG. 1;

FIG. 4 represents a fragmentary sectional view showing the angled relationship of the side support and guide gussets of the support frame the view taken on the line **4–4** of FIG. 3;

FIG. 5 represents a fragmentary view showing the relationship of the platform arms to the support I-beams of the turnover frame the view taken on the line **5–5** of FIG. 3;

FIG. 6 represents an end view looking toward the turnover drive and control mechanism and showing the turnover frame in a partially turned position the view looking in the direction of the arrows **6–6** of FIG. 1;

FIG. 7 represents a fragmentary sectional view on the line **7–7** of FIG. 1 and showing a skid engaging and retaining means for holding and releasing a wooden skid on a movable platform;

FIG. 8 represents a side view of a skid inverter similar to that of FIG. 1 but showing an alternate movable platform power train support and outer end supports for the movable platforms, and

FIG. 9 represents a front view of the skid inverter the view taken on and looking in the direction of the arrows **9–9** of FIG. 8.

Referring now to the FIGURES in which like reference numbers refer to like members throughout the several views of the drawings and specifications, one embodiment of the skid inverter is shown in FIGS. 1 through 7 in which a frame or platform **10** carries the power and control cabinet **12** wherein is mounted a motor and pump **14** of conventional hydraulic design and operation. Operation of the hydraulic control is by a multiplicity of control valves **16** as best seen in FIGS. 1 and 6 by which means the various operations of the turning of the skids is accomplished. Frame **10** in the present embodiment includes two longitudinally disposed beams **18** which extend from the front to the rear of the frame **10**. A roller shaft **19** extends transversely across the rear of the frame and carries upon it two rollers **20** which are supported on their inboard ends by means of bearings in beams **18** and on their outboard ends by means of bearings in supports **21**. As shown rollers **20** are fixed to shaft **19** so that a hydraulic motor **22** as seen in FIGS. 1 and 6 which is operatively connected to the shaft by means of a sprocket and roller chain drive **24** is able to rotate the shaft **19** and by this drive **24** to move the skid inverter forwardly and back as directed by the operator by means of one of the valves **16**. The forward end of frame **10** is mounted upon a pair of free turning rollers **25** which support and provide a mobile means for the forward part of the frame **10**.

The forward part of control cabinet **12** includes a support plate which carries a bearing housing **26**. At the left end of this housing as viewed in FIG. 1 there is seen a ball thrust bearing **27** which is carried by the shaft. Outboard of this bearing is a roller chain sprocket **28** which is mounted on the shaft and acts as a stop collar as well as the means for turning the main shaft and apparatus. As seen in FIG. 6 this drive shaft **29** is shown as of tubular construction providing a passageway through this shaft for hydraulic tubing extending from control valve **16** to hydraulic cylinders to be later discussed in conjunction with the clamping and turning of this apparatus.

In the embodiment here shown the turning means is provided by two hydraulic cylinders **31** and **32** which are best seen in FIG. 6, said cylinders being arranged with the piston shafts of the cylinders parallel and spaced so as to receive the ends of a roller chain **33** which engages the sprocket **28**. The operation of this turning means will be discussed hereinafter in conjunction with the general operation of the apparatus. The front plate **34** of the control cabinet is of substantial construction so that in addition to carrying the bearing housing **26** it is also disposed so as to carry a thrust roller **36** which is centrally located as far as the vertical position is concerned and is positioned at a determined distance down from the axis of shaft **29** (FIG. 1). The forward end of shaft **29** is attached to and carries a turnover frame **38** which in the present instance is formed of two I-beams **39** and **40** which are mounted to a back plate **41**. The upper and lower portions of this frame also includes upper and lower cross bars **42** and **43** which act as stiffeners and supports for the I-beams and also for retaining other apparatus used in conjunction with the turnover mechanism.

Movably mounted upon these I-beams as part of the turnover frame **38** are upper and lower platforms **45** and **46**, which are seen in FIGS. 1 and 3 particularly and also in FIGS. 8 and 9. These platforms include a generally horizontal plate member having downturned sides and ends and having attached to the rear portion thereof a

pair of arms extending towards the axis of the apparatus, the arms of platform **45** being designated **47** and the arms of platform **46** being designated as **48**. Attached to these cross-connected arms are roller carrying members **50** and **51** which have mounted on each of their ends a tapered roller **52**, said rollers being tapered so as to fit the inside of the I-beams in the manner as best seen in FIG. 5. It is to be noted that each of the arms **50** are mounted on the outside of the I-beams while arms **51** are mounted on the inside of the I-beams. As so arranged the arms **50** and **51** as they approach each other are able to pass each other and allow the platforms **45** and **46** to approach to a predetermined closed or inward limit of movement.

As shown in FIG. 3 the movable platforms **45** and **46** are moved towards and away from each other by means of hydraulic cylinders **54** and **55**, which cylinders are mounted in opposite directions. The rod end of cylinder **54**, for example, is attached to the cross arm of arm **48** and the clevis or rear end of the cylinder **54** is mounted upon the cross bar **42** of the turnover frame **38**. In like manner the rod end of the cylinder **55** is attached to the arm **47** and the clevis end of said cylinder **55** is mounted upon the cross bar **43**. To synchronize movement of these movable platforms towards and away from each other there is provided a pair of roller chains **57** and **58** which in the present instance has their lower ends fastened to roller carrying members **51** at clips **59** and **60**. The other ends of these roller chains are attached to the back plate **41** by means of clips **61** and **62** fastened to the back plate **41**. It is to be noted that these chains **57** and **58** are guided over upper and lower shafts **63** and **64** upon which are mounted and attached appropriate sprockets adapted to carry the roller chain in a manner such that as the cylinders are activated to move the platforms together or apart, the roller chains acting in concert with the movement of the cylinders insures that the platforms **45** and **46** move at the same rate and at any particular moment are the same distance from the axis of the apparatus.

Movable at right angles to the side of the frame **38** is a side adjusting means or frame **66** which is moved towards and away from the axis of the apparatus by a pair of hydraulic cylinders **68** and **69** as best seen in FIG. 6. Side slide members **70** and **71** (FIG. 3) are supported and movable in appropriately formed guideways in the frame **38** and provide a means for carrying the skid engaging portion of the side adjusting frame inwardly and outwardly so as to support the side of the pile on the skid as it is turned. Referring again to FIGS. 1 and 2 in particular it is to be noted that upon the extending portions of this side means **66** there are two vertical members **73** and **74** which are pivotally attached to forwardly extending members **75** and **76**. It is to be noted in FIGS. 1 and 2 that, in the embodiment here shown, the members **73** and **74** are in the form of I-beams which are hingedly attached to members **75** and **76** so as to pivot. The I-beams as thus mounted are backed up and supported by members **75** and **76**. The inwardly extended position of the vertical members is shown in the left portion of the view of FIG. 2 while in the folded outer retaining position the I-beam lies adjacent the extending members as seen in the right-hand portion of the FIG. 2. The purpose of this adjustment is discussed in the operation below.

Referring now particularly to FIGS. 1 and 6 it is to be noted that an additional thrust support means may be provided on the turnover frame **38** in the form of rollers **78** and **79**, each being mounted on like attached members **77** disposed to extend rearwardly from each of the cross bars **42** and **43** of the turnover frame **38**. These rollers, as thus disposed, are adapted to engage the front support plate **34** whereby as the support or movable platforms **45** and **46** are brought towards one another so as to engage the load or skid, the load is picked up by the lower of the platforms and all resulting bending of the shaft or frame caused by the load being carried by the lower platform is transferred to the thrust roller **36** and also to either roller **78** or **79**, depending upon which platfrom is in the down position. It is to be noted particularly in FIG. 4 that, extending outwardly from the front support plate **34**, there is provided an angle gusset **80** and on the opposite side an oppositely formed and disposed angle gusset **81**. These gussets are attached to plate **34** so as to form a small angle to provide a ramp for either the roller **78** or **79**, whichever may be moving toward contact with the lower plate. As thus disposed, the angle gusset is adapted to smoothly pick up the load as the roller **78** or **79** moves into engagement with the gusset and thence on to engagement with the plate **34**, the roller carrying its portion of the load all the while the roller is moving toward and to the vertical centerline of the apparatus.

Referring now particularly to FIGS. 1 and 7, there is shown an exemplified means for attaching and maintaining a wooden or like skid against either of the moving platforms **45** or **46**. As viewed, the bottom portion of the frame **10** includes a bottom plate **83** which extends from a near beam **18** to a far beam **18**. On this plate there is attached in precise positions a plurality of threaded nuts which are designated **84**. Each nut is internally formed with a fast pitch thread which in this particular instance is three-quarters inch four pitch threads. In like manner there is disposed and rotatably attached to each of the movable platforms **45** and **46** a like number of threaded screws **86**. Each of these screws has one end formed with a fast pitch thread adapted to engage the threaded portion of nut **84**. Each screw is further provided in its intermediate portion with shoulder means adapted to retain this threaded screw in a bearing block **87** which block is attached to the top plate **88**. A top plate forms a cover for each of the movable platforms **45** and **46**. Extending above and upwardly from this plate **88** is an auger thread portion **86*a*** of the threaded screw **86**. This auger thread portion as it is turned is adapted to engage and enter, as in the manner of a wood screw, the wood portion of a skid platform **89**.

USE AND OPERATION OF SKID INVERTER FIGS. 1–7

In the embodiment shown in FIGS. 1 through 7 and described above, a single operator is normally able to manipulate and turn huge skids containing stacks of paper and the like. The motor and pump **14** is driven by an electrical source not shown, and by means of a readily accessible switch **90** as seen in FIG. 1 the motor is started and drives the pump which may have a pressure limit of 2000 p.s.i. The operating pump draws fluid from the storage tank so as to charge all of the lines which contain and transmit hydraulic fluid under a determined pressure to the various hydraulic cylinders and motors. By means of one of the appropriate control valves **16** a supply of fluid under pressure is fed to the hydraulic motor **22** so that rollers **20** are rotated either forwardly or backwardly so as to move the skid inverter in a forward or in a back direction. Moving of the platforms **45** and **46** towards each other to clamp and lift the skid or to unclamp by moving the platforms to their outer limits of operation is accomplished by operation of another of the control valves **16** which is opened to cause hydraulic fluid under pressure to be fed to one side or the other of the hydraulic cylinders **54** and **55**. As one of the platforms **45** or **46** is lowered into the bottom position the several threaded screws **86** enter the correspondingly spaced threaded nuts **84** and as the screws are moved downwardly in the nuts they are rotated so as to unscrew the auger portion **86*a*** from any skid in which they are engaged or may be resting upon the platform. After the skid inverter has been moved under a new skid by means of the roller drive **22**, the raising of the lower positioned platform causes the disengaging of the threaded portion of the screw **86** from the nut **84**. As the screw moves upwardly in the nut it is rotated and this rotation of the threaded screw **86** causes the auger portion **86*a*** to enter the wood portion of the skid **89** and to thread itself into the wood so as to engage

and firmly retain the skid against the platform surface **88**.

Prior to the lifting and clamping of the skid, the side adjusting means **66** is manipulated so as to adjust the skid of paper to the axis of rotation of the apparatus. This manipulating is performed by moving the side adjusting means **66** in and out through operation of the cylinders **68** and **69** as fed by pressurized hydraulic fluid supplied by the pump and motor **14** and controlled by one of the valves **16**. For narrow skids the vertical members **73** and **74** are turned at right angles to extending members **75** and **76** while for wider skids the vertical members are turned parallel to the extending members. After the load of paper has been centralized by visual maniplation of the side adjusting means **66** and the adjusted vertical members the two platforms **45** and **46** are moved towards each other so as to firmly grasp the skid of paper between the upper and the lower platforms. It is to be noted that during the first operation of this sequence a wood skid platform must be placed upon the top of the pile of paper so that as the apparatus and paper pile is turned the reversed pile of paper will have a skid platform upon which to rest as it is unclamped. However, after a skid platform has been once supplied to the skids of paper it is not necessary to lay a new wooden skid upon the top of the skid of paper since the skid retaining means exemplified by the threaded screw **86** will retain that skid platform that was on the bottom and is now on the top after the skid of paper has been turned. The upper threaded screws remain engaged in the skid platform as there is no threaded nut **84** above the upper movable platform providing means for rotating the screws **86** when the upper movable platform is moved to its upper extreme condition as it is when the skid of paper has been turned and the skid inverter is brought to a condition whereby it may be moved away from the skid of turned paper. To insure that alignment of the movable platforms and the bottom frame is maintained during the movement of the skid inverter toward and under as well as away from the turned skids and so that there is no undue misalignment of the movable platforms during movement of the screws **86** in nuts **84** there is provided tapered alignment stops in the form of wedges attached to the inner ends of the arms **47** and **48**. These stops **92** are adapted by their tapered construction to engage the respective outer sides of the beams **18** so that as the movable platforms are moved into the extreme outer position the wedge stops **92** of the lower disposed platform engage the side of the beams **18**. As the stops engage the beam they cam the turnover frame **38** so as to precisely position the movable platforms. This positioning of the bottom of the frame **10** insures that the movable platforms are moved downwardly into a guided position whereby the screw portions **86** are positioned to engage the threaded nut **84**. The engaged stops **92** insure that no rotational movement is precipitated by removing the hydraulic pressure from the turnover cylinders **31** and **32**.

As noted above the vertical members **73** and **74** providing side stops for the side adjusting means **66** are turnable to two positions so that if the skid of paper is narrower than the normal limit of the adjusting means as provided by the width of the general turnover frame **38** the members **73** and **74** may be turned so that an additional inner stop limit to the paper is provided by the turning of the vertical members **73** and **74** to the inwardly extending position. For normal use they are turned to a position adjacent the extending members **75** and **76**.

It is to be further noted that the roller chains **57** and **58** are caused to be moved at the same time and speed by means of the connected shafts and sprockets. As thus arranged no matter how unbalanced the load may be the platforms move at the same rate and speed and both sides of each platform move at the same speed. With this type of control of the platforms and since the turnover frame is always rotated through the same arc wherein the side adjustment frame moves from one side to the bottom and thence to the other side, therefore with this arrangement certain operations can be done. For example, if the stack is of heavy paper or cardboard, the turnover frame may be stopped at the horizontal position, the movable platforms moved apart a small amount and with the stack supported by the side adjusting frame, sheets may be pulled from the stack and then the movable platforms are again moved to the clamp position and the inverting of the load is completed.

It is also to be noted that under normal operations means are provided in the hydraulic circuit to limit the pressure of the hydraulic flow to cylinders **54** and **55** whereby the clamping pressure on the stack is a predetermined limit. It is sometimes desirable to provide a greater pressure so that a completed stack may be placed on a pallet and strapped thereto. When this operating condition is desired the pressure to the cylinders is increased so that the platforms apply the desired increase of pressure on the stack to be strapped.

It is to be further noted that the side adjusting means provides with the vertical members a method of straightening of the stack before the skid is clamped for inverting. The side adjusting means is brought into engagement with the side of the stack, after which the side adjusting means is continued to be moved against the stack until the desired alignment is secured.

On certain occasions when it is desired to use the inverter to pallet the stacks it is convenient to remove the wheels and imbed the frame **10** in the floor so that the upward face of plate **88** of the movable platforms are at floor level so that a pallet may be slid on and off the lowered movable platform.

ALTERNATE CONSTRUCTION OF FIGS. 8 AND 9

The skid inverter of FIGS. 8 and 9 shows an alternate construction of the movable platforms used therewith. In certain plant operations power or lift trucks may be used to move the skids of paper onto the movable platforms. When this transport means is used it is desirable to make the top plate **88** more substantial. In addition a pair of outer support blocks **100** are provided. These blocks are preferably attached to plate **88** on each platform and are positioned so that they engage the beams **18** when the platforms **45** and **46** are moved to the open position. These blocks insure that the outer end of the platform engage the beam to support part of the load as the platforms are moved to the open position.

In FIGS. 1, 6 and 8 are shown turning stops **102** and **103**. These stops are both attached to I-beam **40** and are disposed so that as seen in FIGS. 1 and 8 the block **102** engages the near side of the control cabinet **12** when the skid inverter has the side adjusting frame **66** at the rear or away as seen in FIG. 1. As shown, the stop **103** is disposed about the same distance above the axis of rotation as is stop **102** below the axis. When the turnover frame is rotated one hundred eighty degrees, the stop **103** swings over the top of the cabinet **12** and when it reaches the far side of the cabinet it engages the side to provide a maximum limit of travel of the turnover mechanism. In its one hundred eighty degree removed position, stop **103** is about the same amount below the axis of rotation as is stop **102** as shown. As stop **103** is moved to the cabinet engaging position, the stop **102** is swung to an above-the-cabinet position.

It is to be further noted that in FIG. 8 there is shown a roller **106** which is one of a pair of rollers. These rollers in the manner of thrust roller **36** are positioned below the axis of shaft **29**. These rollers **106** are spaced equal distances from a theoretical vertical line extending from the axis of shaft **29**. The rollers **106** have their axis disposed to intersect the axis of shaft **29**. The two or more rollers are disposed to accept the thrust of the load and to distribute this load to the plate **34** to reduce the concentration of the load on this plate.

Referring particularly to FIG. 2, it is to be noted that a latching means **110** is provided on the vertical member

73 and forwardly extending member 75. A like latch is provided on vertical member 74 and extending member. In use each latch is actuated to retain the vertical member in the adjacent to member 75 position. A latch made by Corbin Cabinet Lock Division, New Britain, Conn., and identified as a drawer pull catch has been satisfactorily used.

Referring particularly to FIGS. 8 and 9, there is shown a support block 112 which is attached to cross bar 43 and back plate 41. This block is of a thickness and is drilled to provide a tongue member to engage and retain the clevis end of cylinder 55. A like block 114 is attached to upper cross bar 42 and back plate 41 to support cylinder 54. As seen in FIG. 8, the block is bored so that the shaft 64 may pass freely therethrough.

Referring finally to FIGS. 1 and 6, it is to be noted that turnover cylinders 31 and 32 have the outer ends of their respective piston rods 116 and 118 provided with threads. A threaded cap member 120 has a nut portion having threads sized so as to tightly mate and engage the threaded end. Extending end portions are sized and drilled to accept end attaching pins 122 by which chain 33 is connected to the cylinders.

ASSEMBLY, ADJUSTMENT AND USE OF ALTERNATE CONSTRUCTIONS

The attaching of support blocks 100 on the movable platforms is a matter of choice as it is contemplated that when desired the blocks may be attached to the beams 18. The support blocks insure that the deflection or droop of the outboard end of the platforms is compensated for as the plate member 88 is brought in way of beam 18.

The cylinders 31 and 32 are of sufficient stroke so as to rotate the turnover mechanism at least one hundred eighty degrees. The stops 102 and 103 provide the turning limits for the turnover mechanism when the loads are in clamped and turning condition. The alignment stops 92 maintain the positioning of the platforms 45 and 46 when the turnover mechanism is in the open condition.

The sprocket 28 is keyed to shaft 29 to positively rotate this shaft. The positioning of the teeth of the sprocket in relation to the shaft is calculated prior to assembly. Because of wear and stretch of the chain and the normal manufacturing tolerances the initial and operational relationship of the cylinder stroke to the sprocket is only grossly determined. Precise and fine adjustment of the chain 33 is provided by turning the cap member 120 inwardly and outwardly on the threaded end of the piston rod. This adjustment insures that the cylinders will positively move the turnover mechanism to bring the stop 102 or 103 into positioning engagement with cabinet 12.

The latching means 110 provided on vertical members 73 and 74 are contemplated to engage the members to retain them in the adjacent position against the member 75. The latch may be a mechanical disconnecting snap or may be a permanent magnet or other like devices.

The mounted and attached support blocks 112 as provided in FIGS. 8 and 9 are disposed so as to reinforce the crossbar back plate construction of the turnover frame. This reinforcing of the framework permits the clamping and lifting load of several thousand pounds to be effected without the distortion of the frame ends which tend to bind the shafts 63 and 64.

Terms such as "in," "out," "up," "down," "right," "left," "near," "far" and the like are applied to the skid inverter as shown and described in conjunction with the drawings. These terms are used merely for the purpose of description and do not necessarily apply to a particular position in which the skid inverter may be constructed or used.

The conception of the skid inverter and its several novel features is not limited to the example above-described but departures therefrom may be made within the scope of the accompanying claims and protection is sought to the broadest extent the prior art allows.

What is claimed is:

1. A skid inverter for turning skid loads of paper and the like, the inverter including a turnover frame carried by a shaft rotatably mounted in and at a fixed distance above the floor of a support frame, the turnover frame having side members formed to carry and retain a pair of movable platforms which are movable toward and away from each other so as to grasp and release a skid load of paper, the turnover frame being rotatable to invert a grasped load, the turnover frame having a side adjusting member movable so as to position the load between the movable platforms, the improvement in the skid inverter comprising: (a) a thrust supporting means positioned below the turnover frame shaft and disposed to accept the thrust of the load as the frame is rotated so as to permit the frame to be turned with a heavy load and without undue bending of the shaft; (b) a sprocket carried on the turnover frame shaft; (c) a pair of hydraulic cylinders mounted on the support frame, the cylinders actuated by pressurized hydraulic fluid whose flow is controlled by the operator of the equipment; (d) a roller chain attached to each of the piston rods of the cylinders, the chain extending from each rod to and over the sprocket on the turnover shaft; (e) a threaded end on each piston rod, and (f) a threaded cap member threadedly retained on the piston rod and having an extending end portion disposed to retain the end of the chain, the threaded cap member as it is axially moved on the piston rod providing infinitely adjustable means for taking up wear in the chain and to adjust the relationship of the cylinder action to the desired one-half revolution of the shaft.

2. A skid inverter as in claim 1 in which the turnover frame has an outboard roller mounted on each end of the frame, and in which the support frame includes an angled gusset attached to and extending from each side of a front support plate forming a part of the support frame whereupon as the turnover frame is rotated one of the outboard rollers is brought in the way of the face of an angled gusset which is disposed so that as the roller moves inwardly over the face of the gusset and toward the support plate the roller is cammed toward the plane of the support plate and upon reaching the face of the support plate the roller moves onto and over this face, the roller, while in engagement with the gusset and support plate, transmitting load forces form the turnover frame to the supported gusset and front plate.

3. A skid inverter as in claim 1 in which is included a side adjusting means having a plurality of pivoted members carried by a plurality of extending members forming a part of the frame of the side adjusting means, said pivoted members movable to one of two positions ninety degrees from each other and in these positions providing two limits for engagement of the side adjusting means and the side of the skid, whereby the pivoted members of the side adjusting means are moved to the two limits so as to accommodate loads greater than and less than the width of the turnover frame.

4. A skid inverter as in claim 3 in which the pivoted members are disposed in a vertical manner and in which there are provided cooperative means between the pivoted member and an extending member for releasably retaining the pivoted member in one of the two limit positions.

5. A skid inverter as in claim 1 in which each of the movable platforms include a plurality of rotatably retained threaded screws arranged in a preselected precisely positioned pattern, and the support frame has a plurality of threaded nuts mounted therein and precisely positioned in a pattern compatible with the pattern of the threaded screws and so that each screw may be threaded into and rotated by advancing engagement in a like threaded nut when the platform is brought toward and to the support frame, each screw provided with a fast-pitch thread on one end and an auger thread formed on the other end,

the screw as its fast-pitch threaded end enters the nut is rotated thereby and as it proceeds into the nut and is rotated the auger-threaded end is turned in a disengaging direction and as the movable platform is raised from the support frame the screw is moved from the nut and is turned thereby so that the auger thread is rotated in an engaging direction and when pressed against a wood skid as it is rotated in the engaging direction enters the wood of the skid to hold the skid adjacent the platform.

6. A skid inverter as in claim 1 in which the turnover frame is provided with a pair of turning stops disposed on the same side of the frame and spaced selected distances above and below the axis of rotation, the stops positioned from the axis a preselected amount so that the turnover frame with one stop in engagement with the support frame is at one limit of rotation and with the turnover frame turned to bring the other stop in engagement with the support frame the turnover frame is permitted to turn only through the desired half-circle of movement and to precise limits of movement.

7. A skid inverter as in claim 6 in which there is disposed on each movable platform an alignment means positioned and sized to cooperatively engage complementary means on the support frame so that as a movable platform is lowered to the support frame the alignment and complementary means are brought into engagement to retain the turnover frame and the movable platforms carried by the frame in positive alignment in the absence of auxiliary turning forces.

8. A skid inverter as in claim 7 in which the alignment means on each movable platform includes a tapered pair of stops and the complementary means on the support frame is a pair of beam members, the stops disposed to enter and engage facing sides of the beam members as the movable platform is lowered to the support frame.

9. A skid inverter for turning skid loads of paper and the like, the inverter including a turnover frame carried by a shaft rotatably mounted in and at a fixed distance above the floor of a support frame, the turnover frame having side members formed to carry and retain a pair of movable platforms which are movable toward and away from each other so as to grasp and release a skid load of paper, the turnover frame being rotatable to invert a grasped load, the turnover frame having a side adjusting member movable so as to position the load between the movable platforms, the improvement in the skid inverter comprising: (a) at least one forwardly extending member portion of the support frame, said member disposed beneath the turnover frame during the rotation thereof; (b) an alignment means provided on each movable platform; (c) complementary alignment means positioned and sized to cooperatively engage the alignment means of the movable platform as the platform is lowered to the support frame and as the alignment means are in engaged condition the turnover frame and movable platforms are maintained in positive alignment in the absence of auxiliary turning forces; (d) a pair of hydraulic cylinders mounted on the support frame and adapted to rotate the turnover frame through at least one-half a revolution, and (e) a pair of turning stops disposed on the same side of the frame and spaced selected distances above and below the axis of rotation, the stops positioned so that the turnover frame rotated to bring one stop in engagement with the support frame the turnover frame is at one limit of rotation coinciding with axial positioning of the turnover frame when the alignment means engaged, and with the frame turned to bring the other turning stop in engagement the turnover frame is at its other precise limit of movement.

10. A skid inverter as in claim 9 in which there are disposed between the outer portions of the movable platforms and the support platform, at least one support block adapted to support the outer end of the movable platform as it is brought to an open position.

11. A skid inverter as in claim 9 in which the alignment means on the movable platform includes a tapered pair of stops and the complementary means on the support frame is a pair of beam members, the stops disposed to enter and engage facing sides of the beam members as the movable platform is lowered to the support frame.

12. A skid inverter as in claim 9 in which the turnover frame includes end crossbars and a back plate and in which a support block is attached to each crossbar and back plate to reinforce the frame, and in which an inwardly extending portion of the block is sized to retain the end of a hydraulic cylinder which is actuated to provide the movable power means for the movable platforms.

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214—1