May 2, 1967 C. E. YOUNGBLOOD 3,317,060

COIL HANDLING DEVICE

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Fig. 1

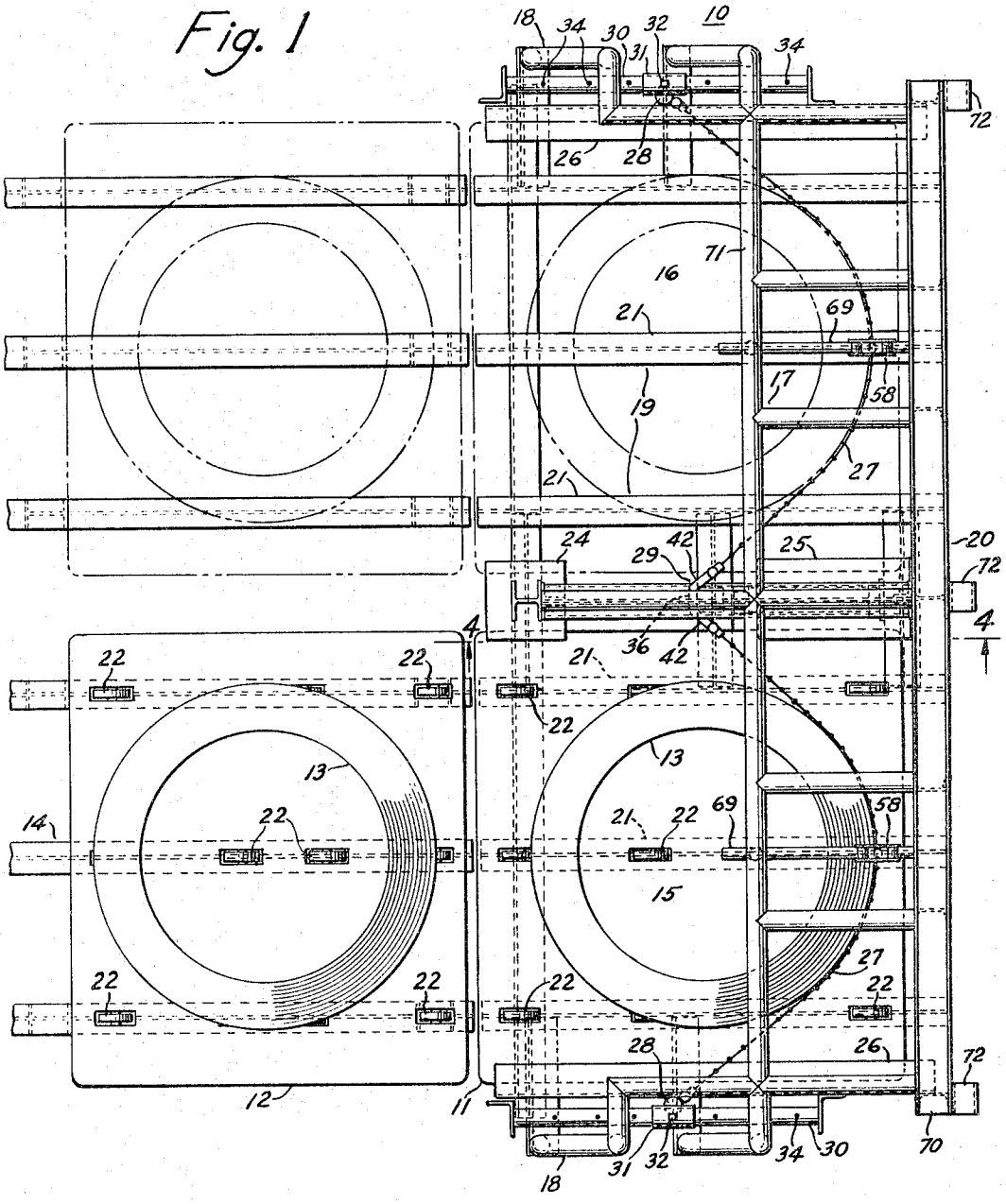

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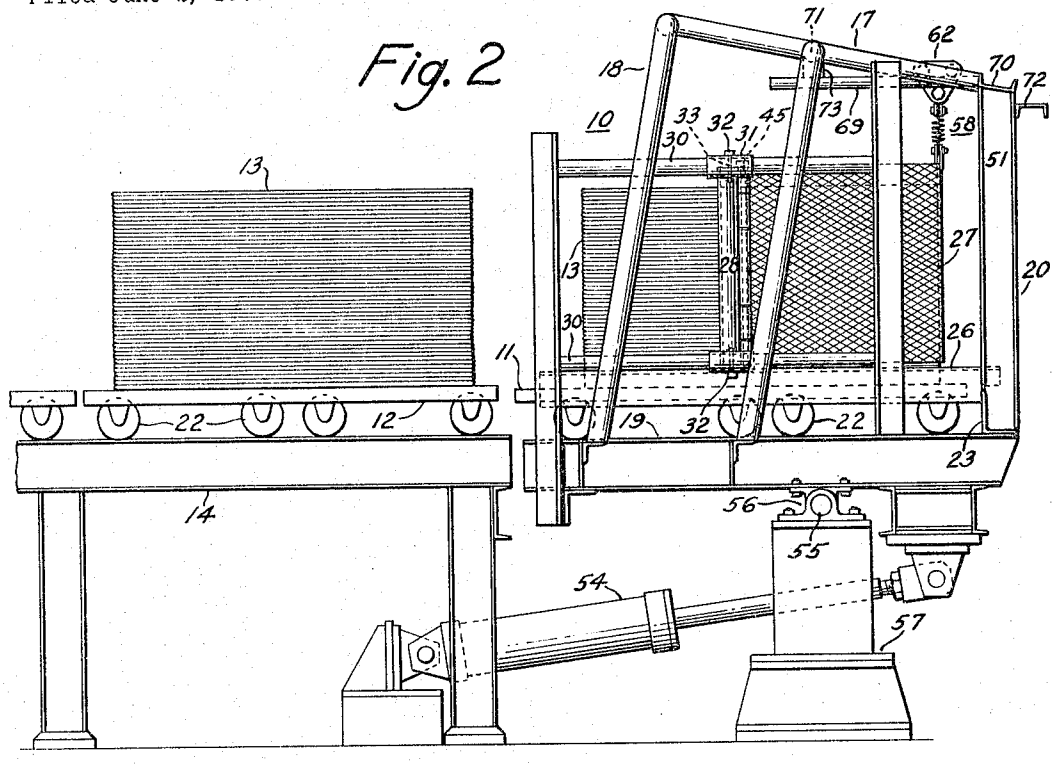
Fig. 2



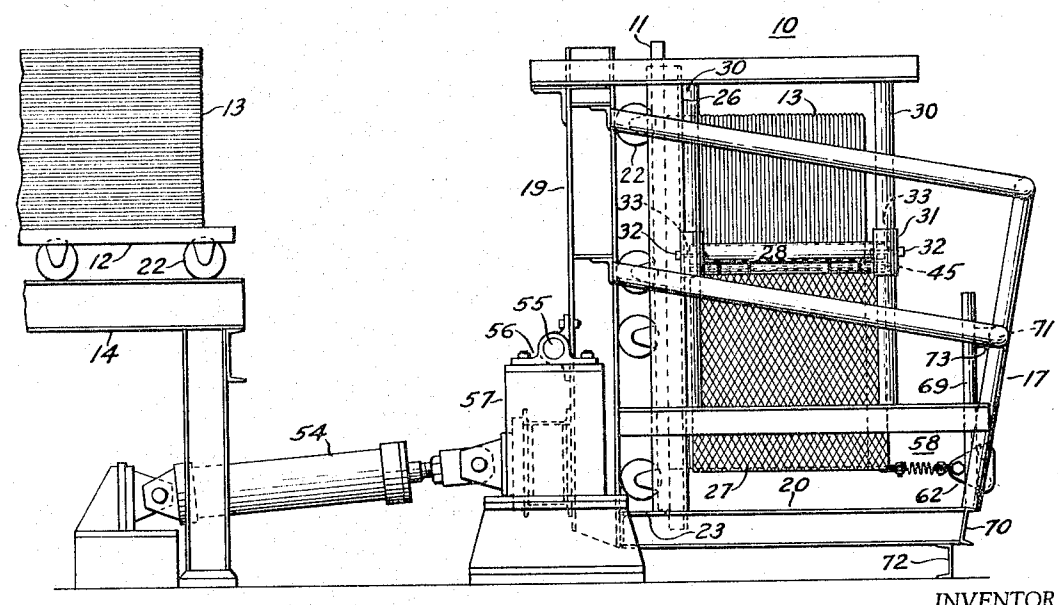


Fig. 3

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Fig. 4

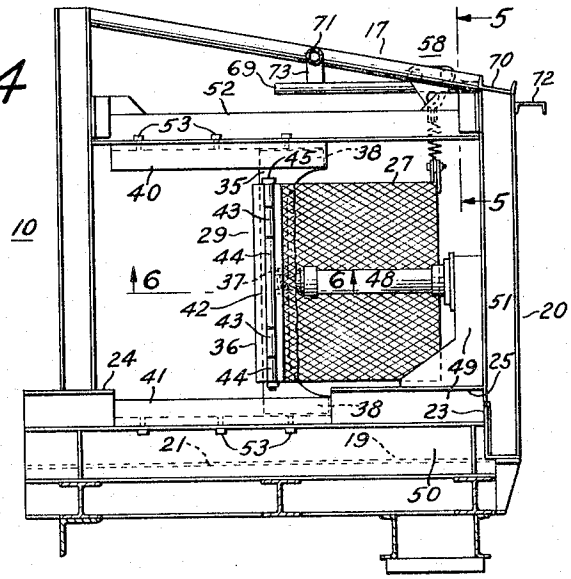


Fig. 5

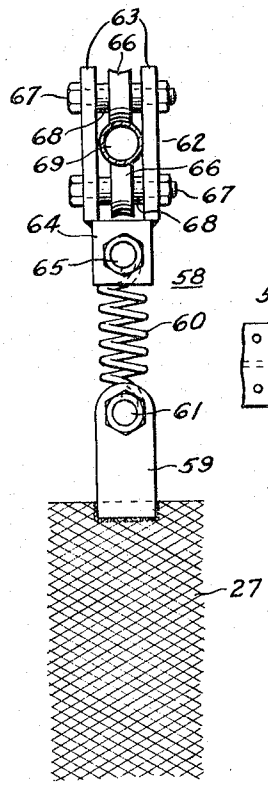
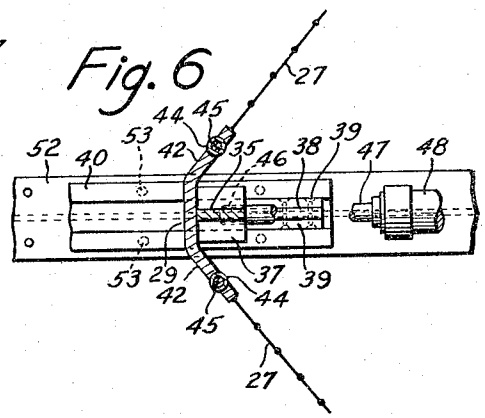


Fig. 6



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3,317,060

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3,317,060

COIL HANDLING DEVICE

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3 Claims. (Cl. 214—1)

This invention relates in general to the manipulation of coils and more particularly to tilting coils of rod and strip from a coil receiving position to a coil delivering position.

In steel mill operations where coils of rod and/or strip are handled it is frequently necessary to tilt the coils for further processing of the coiled material. Coils in storage or as discharged from an annealing furnace are frequently horizontally disposed, i.e., with the central aperture of the coil extending vertically. It is necessary to tilt the coil on edge so that the lifting means, e.g., a C-hook, or a single ram mounted on a fork lift truck, can engage the coil.

Means for tilting coils, commonly referred to as downtilters or coil tilters, are well known. However, great care must be exercised in loading the coil on the tilter and tilting it, otherwise damage occurs to the convolutions of the coiled material and to the tilter structure. The use of flexible belt means for the handling of coil is known. However, the flexible nature of the belt has made its application to a tilting operation impossible. The wide range in size of coils handled requires an apparatus that is easily and quickly adjustable.

It is, therefore, an object of this invention to provide an improved apparatus for tilting coils of material from a coil receiving position to a coil delivering position without damaging the material or the structure.

A further object of the invention is to provide an adjustable apparatus to accommodate a wide range of coil sizes.

A still further object of this invention is to provide means for adapting flexible material to a tilting apparatus.

The present invention comprises generally a tilting carriage adapted to receive coils of rod or strip material with means for cradling the coils during the tilting operation to prevent the coils from falling and consequently damaging the coiled material and the carriage structure. The cradling means is flexible in order to conform to the shape of the coil being tilted and is adjustable to varying sizes of coils. The flexible cradle of the instant invention is provided with suspension means for maintaining said cradle readily adaptable to receive coils.

Although reference is made to the handling of coiled material, it should be understood that the invention is equally adaptable to handling any substantially cylindrical shape.

Referring to the drawings:

FIGURE 1 is a top plan view of the apparatus;

FIGURE 2 is a side elevation of the apparatus in a horizontally disposed position;

FIGURE 3 is a side elevation of the apparatus in the tilted position;

FIGURE 4 is a sectional view of the apparatus, taken on line 4—4 of FIGURE 1;

FIGURE 5 is an enlarged view of a flexible belt suspension means, taken on line 5—5 of FIGURE 4; and

FIGURE 6 is a sectional view of the movable crosshead taken on line 6—6 of FIGURE 4.

Referring now in detail to the drawings, and first to FIGS. 1, 2 and 3, the coil handling apparatus of the present invention is seen to comprise a carriage generally designated by the reference numeral **10**. Trays **11** with coil **13** resting thereon is seen in position for tilting on carriage **10**. A similar coil **13** is resting on tray **12** which is positioned on conveyor **14**.

The carriage **10**, comprising apparatus adapted to receive coils of varying sizes is shown with two compartments **15** and **16**. The front wall **17** and side walls **18** are preferably constructed of tubular members. The rear wall **19** and bottom wall **20** of the tilting carriage **10** may be constructed of structural members. The spaced front **17** and rear **19** walls are connected to each other by bottom wall **20**. The walls are secured to one another, as by welding, to form a rigid enclosure for the coils being tilted. Front wall **17** is somewhat lower than rear wall **19** to permit removal of the titled coils, as by lifting means suspended from an overhead crane or a single ram mounted on a fork lift truck. The members **21** of rear wall **19** serve as runners for the wheels **22** of the coil supporting trays. The trays are pushed onto the carriage by the following tray **12** as conveyor **14** (conveyor mechanism not shown) moves it toward the tilting carriage **10**. The leading edge of tray **11** contacts stop plate **23** which limits the forward movement of said tray. Stop plate **23** is mounted on the inside face of the bottom wall **20** adjacent the intersection of rear wall **19** and said bottom wall. Keeper plates **24** and **25** and keeper angles **26** are mounted on the carriage spaced away from the inside face of said rear wall **19** a distance sufficient to allow passage of the coil tray edges as it is rolled onto the carriage. The keeper plates maintain the position of the tray as the tilting operation proceeds and when the coil is removed.

A cradle is formed in each of the compartments **15** and **16** by a flexible belt **27**, e.g. a woven metal fabric, which is hingedly fixed to post **28** on one end and hingedly fixed to a movable plate crosshead **29** at the other end. Post **28** is slidably mounted on tubular guide members **30** by means of sleeves **31** which are welded to the top and bottom of said post **28**. Adjustment of the fixed end of the belt is accomplished by inserting pins **32** through holes **33** in sleeves **31** and a matching hole, one of several spaced apart holes **34**, in guide members **30**.

The movable mounting of the other end of said flexible belt **27** is shown clearly in FIG. 4 to which particular reference is now made. The movable plate crosshead **29** comprises a slide plate **35**, mounting plate **36** for one end of said flexible belt, and mounting block **37** for cylinder rod **47**, shown in FIG. 6. The U-shape slide plate **35** has short shallow legs with the opening of the U facing wall **20**. The short legs **38** of the shallow U form the sliding portions of the plate. Brass liners **39** are mounted on either side of said legs **38** to provide sliding engagement with the inner surfaces of slotted guide rails **40** and **41**. The outside of the surfaces of the short legs **38** and the outside bottom of the U are straight and the jointure of said legs and said bottom form substantially square corners. The flexible belt mounting plate **36**, somewhat shorter than the slide plate **35**, is fixed at right angles to and approximately centered on slide plate **35**. As is clearly shown in FIG. 6, the mounting plate **36** is bent so that wing portions **42** are formed extending toward wall **20**. Hinge mountings **43**, which may be short sections of pipe, are welded to the longitudinal edge of said wing portions **42**. The hinge mountings **43** engage mating pipes **44** fixed to the flexible belt **27** to be hingedly joined by hinge pin **45**. The other end of said flexible belt **27** is fixed to post **28** in like manner.

Mounting block **37**, drilled and tapped to receive the threaded end portion **46** of cylinder rod **47**, is fixed to the crosshead **29** intermediate the ends thereof. The base of the hydraulic cylinder **48** is removably mounted on bracket **49** which is fixed to members **50** and **51** of rear wall **19** and bottom wall **20** respectively, as shown in FIG. 4. The slotted guide rails **40** and **41** are of sufficient length to accommodate the length of stroke of hydraulic cylinder rod **47**. The bottom guide rail **41** is substantially

U-shaped and the top guide rail **40** is an ineverted U shape, said guide rails fixed to structural members **52** and **50** respectively by bolts **53**. It is thus seen that by activating hydraulic cylinder **48** cylinder rod **47** extends through the length of stroke to adjust flexible belt **27** in firm engagement with the coil.

The tilting apparatus as seen in FIGS. 2 and 3 is tilted through approximately 90° by any suitable means, as for example, in the pictured embodiment, a double acting hydraulic cylinder **54**. The said apparatus is rotated about shaft **55** which is journaled in bearings **56** supported from the floor on mountings **57**. When the apparatus is in the tilted position shown in FIG. 3 the front wall **17** and rear wall **19** are vertical forming an open topped enclosure for containing the tilted coils.

The flexible belt **27** is suspended at a point intermediate its ends to maintain said belt in an upright position while the carriage is being loaded. The suspension device **58** shown in detail in FIG. 5 comprises a clamp **59** fixed, e.g. by welding, to the flexible belt **27** at the lower end of said clamp and removably attached to a spring **60** by means of spring mounting bolt **61** at the upper end. The upper end of spring **60** is removably attached by spring mounting bolt **65** to a roller guide **62**. Said roller guide comprises two side plates **63** spaced apart by and fixed to bifurcated member **64** to which spring mounting bolt **65** is removably attached. Roller guide **62** is provided with a plurality of rollers **66** mounted on shafts **67** and spaced away from side plates **63** by spacers **68**. The suspension device **58** is thus enabled to roll in and out, as required, on support member **69** as the flexible belt **27** is moved by means of hydraulic cylinder **48**. The roller guide support member **69** may be a section of pipe, as seen in FIG. 5, or any other shape suitable for forming a contact surface for the rollers **66** of roller guide **62**. Said support member **69** is mounted above the flexible belt **27** intermediate its ends, fixed to the longitudinal structural member **70** of bottom wall **20** and to the longitudinal tubular member **71** of front wall **17** by means of stub **73**, substantially parallel to the plane of rear wall **19**.

In operation:

The tilting carriage **10** in the coil receiving position, with front and rear walls substantially horizontal receives tray **11** with rod bundle **13** resting on said tray. Tray **11** is propelled onto the tilting carriage by the following tray **12** which is engaged by conveyor **14**. The wheels **22** of tray **11** are guided on runners **21** which members also form the rear wall **19** of the carriage **10**. Hydraulic cylinder **48** is activated to cause crosshead **29** to move forward toward the coil. The flexible belt **27**, being hingedly fixed at one end to post **28** and hingedly fixed at the other end to the movable crosshead **29** is moved into firm peripheral engagement with the convolutions of the coil **13**. Sleeves **31** are adjusted on post **28** to accommodate the coil size when necessary. The double acting hydraulic cylinder **54**, positioned at the center of carriage **10**, is activated, causing the tiltable carriage **10** to rotate about shaft **55** allowing carriage support members **72** to rest on the floor. The carriage is now in the coil delivering position with the front wall **17** and rear wall **19** substantially vertical. The flexible belt **27** firmly cradles the coil **13** during the rotation of approximately 90° preventing the coil from sliding from

the tray to the bottom of the carriage thus causing damage to the coil convolutions as well as to the structure. Lifting means, e.g. a single ram mounted on the front of a fork lift truck, can easily engage the tilted coil and lift it from the carriage to move said coil to a new station for further processing of the coiled material. The now empty tray **11** is lifted out by conventional lifting equipment and the reversal of the hydraulic cylinder returns the empty carriage to the coil receiving position.

The apparatus thus described provides means for easily and safely tilting coils of rod or strip so that the coil is rotated through approximately 90° from a horizontally disposed position as in FIG. 2 to a vertically disposed position as in FIG. 3.

Although the foregoing description and drawings illustrate a two compartment tilter for handling two coils at one time, it will be obvious that the principles of the invention here disclosed could be applied to a single compartment tilter as well. It should also be understood that the disclosed apparatus is equally adaptable to the described operation in reverse, i.e. rotating a coil from a vertically disposed position to a horizontally disposed position.

I claim:

1. In combination with a coil tilting device of the type wherein a coil carriage comprising front and rear walls is provided with means for tilting the carriage from a coil receiving position to a coil delivering position, the improvement which comprises:

(a) a flexible belt located between and substantially longitudinally coextensive with said walls, for engaging a coil inserted therebetween,

(b) means attached to one end of said walls for securing one end of said belt,

(c) means securing the other end of said belt, said means adapted to move said belt toward said coil, and

(d) means secured to said belt intermediate its ends for suspending said belt when said carriage is in a coil receiving position, said means being movable on a supporting structure toward and away from said coil.

2. The combination of claim **1** wherein:

the means recited in subparagraph (d) includes a clamp fixed to said flexible belt, a spring removably attached to said clamp at one end and removably secured to a roller guide at the other end, said roller guide movably mounted on a support member fixed to said carriage.

3. The combination of claim **1** wherein:

the means recited in subparagraph (b) is adapted to be adjustably fixed in any one of several spaced apart locations.

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