United States Patent

Lindstaedt

[15] **3,695,532**

[45] **Oct. 3, 1972**

[54] **APPARATUS FOR PREPARING REELS OF SHEET MATERIAL FOR UNWINDING**

[72] Inventor: **Horst Karl Lindstaedt,** London, England

[73] Assignee: **Mason Scott Thrissell Engineering Limited**

[22] Filed: **July 2, 1970**

[21] Appl. No.: **51,837**

[30] **Foreign Application Priority Data**

July 5, 1969 Great Britain.....33,987/69

[52] **U.S. Cl.**.....**242/55,** 214/1 R, 214/6 P, 242/79, 242/58.6

[51] **Int. Cl.** **B65h 75/02**

[58] **Field of Search**.....242/55, 79, 58.6; 214/6 P, 214/1 R

[56] **References Cited**

UNITED STATES PATENTS

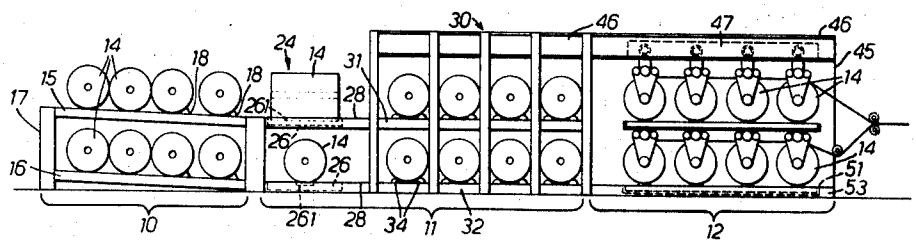
2,599,720	6/1952	Prevost	242/58.6
3,045,802	7/1962	Miller, Jr.	214/6 P X
3,150,706	9/1964	O'Brien	242/79 X
3,276,711	10/1966	Martin	242/58.6
3,438,593	4/1969	Reed	242/79

Primary Examiner—Stanley N. Gilreath
Assistant Examiner—Milton S. Gerstein
Attorney—Young & Thompson

[57] **ABSTRACT**

Apparatus for preparing large and heavy reels of sheet material such as paper or thin board for a subsequent unwinding operation, comprise a stand for supporting a reel and allowing the reel to rotate about a horizontal axis and means to allow pivotal movement of the stand about a vertical axis, so that damaged outer layers of the reel can be removed and the reel can be turned through 180° if necessary to ensure that the direction of web pull-off is correct. The stand preferably also comprises weighing means for indicating the weight of the reel and of any waste material removed from it. A jack and rollers may be used to allow the reel to be rotated. A support unit with an individual elevating jack may be used to raise each reel to the correct height for engagement with supporting means on a transporter which carries the prepared reels to an unwind station.

4 Claims, 7 Drawing Figures



PATENTED OCT 3 1972

3,695,532

SHEET 1 OF 5

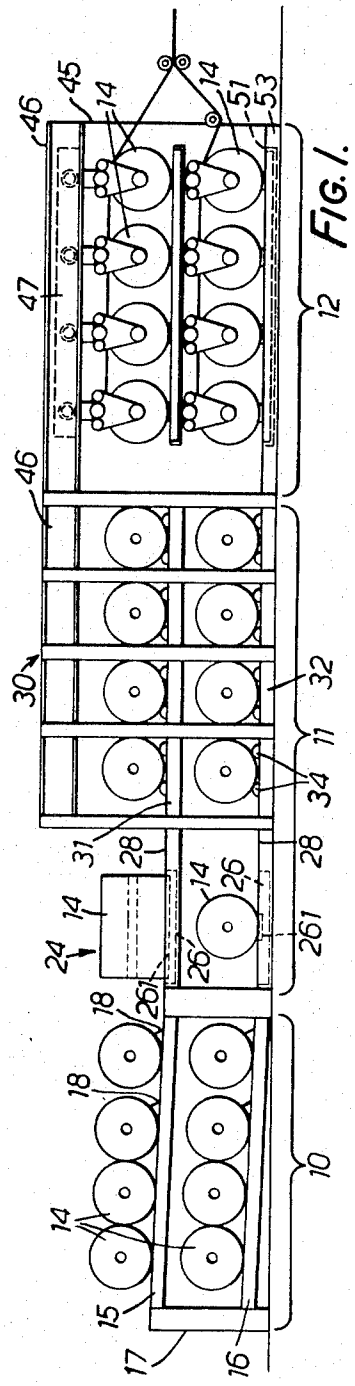


FIG. 1.

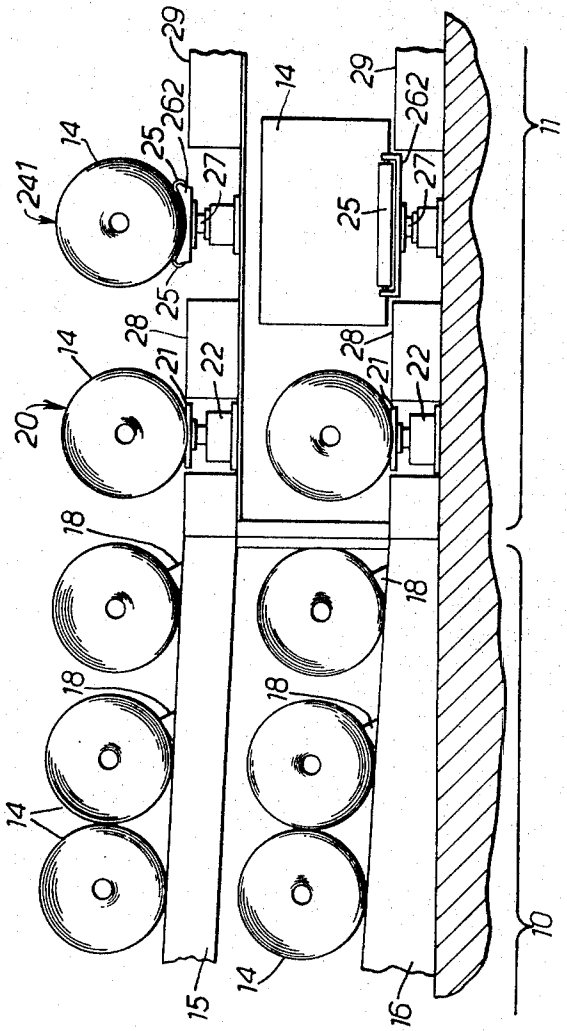


FIG. 2.

INVENTOR
HORST KARL LINDSTAEDT
BY Young & Thompson
ATTORNEYS

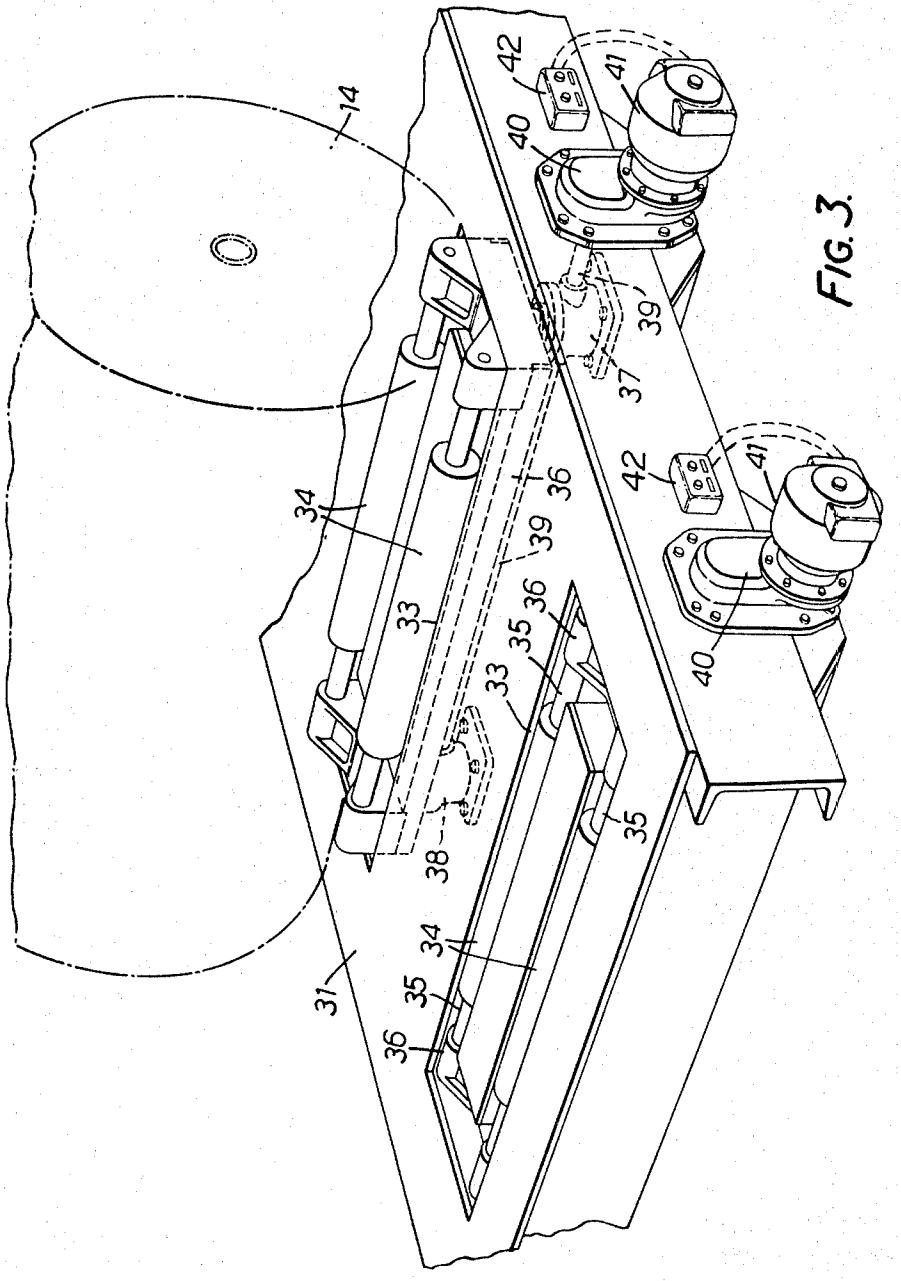


FIG. 3.

INVENTOR
HORST KARL LINDSTAEDT
BY Young + Thompson
ATTORNEYS

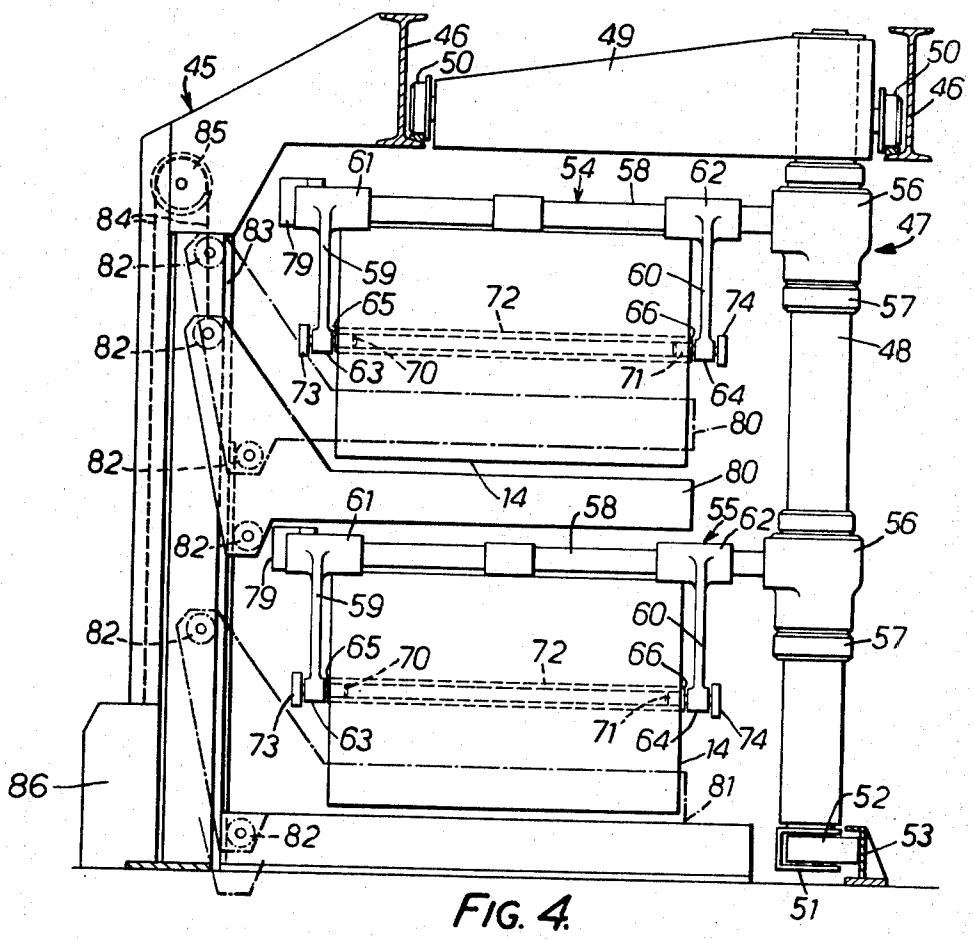


FIG. 4.

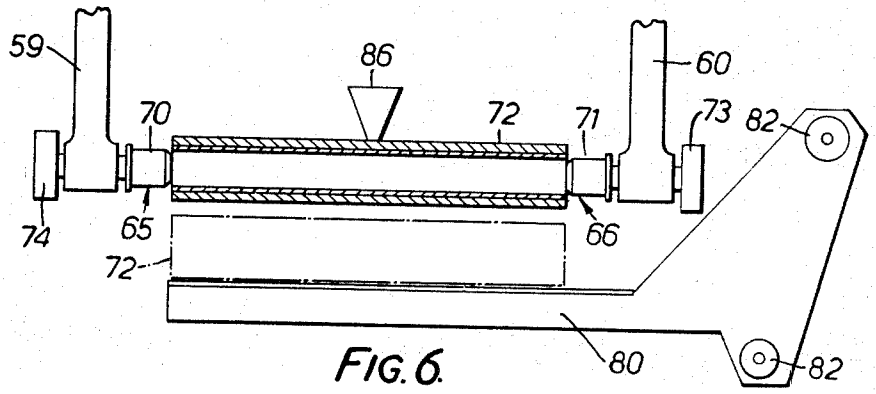


FIG. 6.

INVENTOR
HORST KARL LINDSTAEDT
BY Young & Thompson
ATTORNEYS

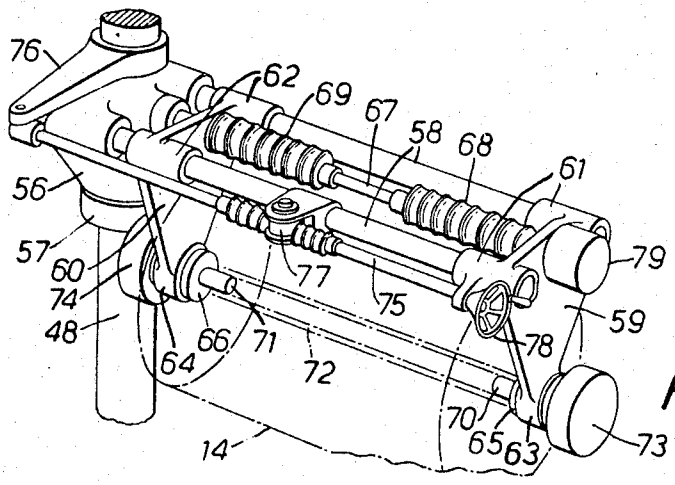


FIG. 5.

INVENTOR
HORST KARL LINDSTAEDT
BY Young + Thompson
ATTORNEYS

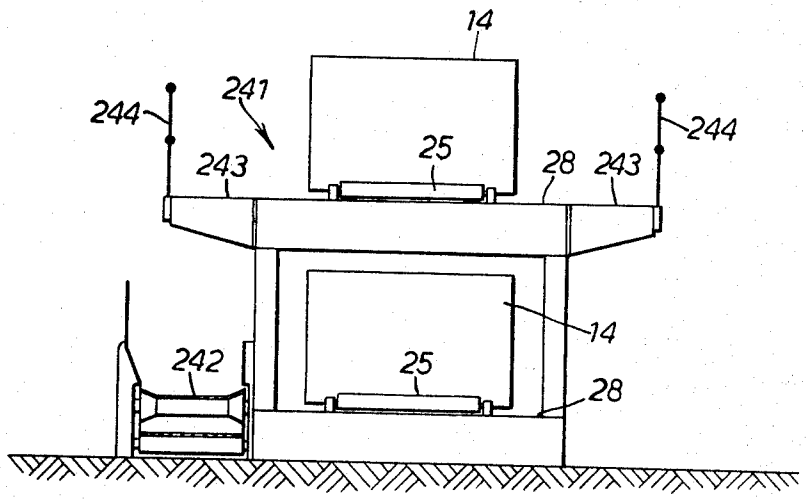


FIG. 7.

INVENTOR
HORST KARL LINDSTAEDT
BY Young & Thompson
ATTORNEYS

APPARATUS FOR PREPARING REELS OF SHEET MATERIAL FOR UNWINDING

This invention relates to apparatus for preparing reels of sheet material such as paper or thin board for a subsequent unwinding operation, and is particularly though not exclusively applicable to a preparation apparatus forming part of an unwind stand from which a plurality of paper webs are unwound simultaneously and fed to an automatic machine such as a multiple sheet cutter.

Before being unwound the reels must be prepared, for example by removing a number of layers of the sheet material itself, if they have been damaged. The reels as received from a winder are of various sizes and often of very considerable weight, up to say 2 tons, and such preparation of the reels for unwinding presents considerable problems. Moreover it is usually necessary that the reels should be finally located at the right height, and in the correct attitude so that the webs will run off in the correct direction. This may involve turning a reel through 180° about a vertical axis, to reverse its ends, and elevating the reel through a variable height depending upon its external diameter after the outer layers have been removed.

Now from one aspect the invention consists in apparatus for preparing a reel of sheet material such as paper or thin board for a subsequent unwinding operation, comprising a stand for supporting a reel and allowing the reel to rotate about a horizontal axis and means to allow pivotal movement of the stand about a vertical axis.

Preferably the apparatus also includes weighing means for providing an indication of the weight of the reel and/or of any material removed from the reel.

From another aspect the invention consists in a stand for preparing a reel of sheet material, for a subsequent unwinding operation, comprising a support for a reel to allow the reel to rotate about its axis, and weighing means for providing an indication of the weight of the reel and/or any material removed from the reel.

In any case the stand is preferably provided with a pair of horizontal free running rollers, and jacking means for elevating the stand to raise a reel from a support such as a platform, to allow rotation thereof. The apparatus may also include a receptacle into which waste material from the reel can be delivered, or a conveyor for removing the waste material.

From yet another aspect the invention consists in apparatus for preparing wound reels of sheet material for a subsequent unwind operation, including individual support units at each reel station, each support unit having an individual elevating jack for raising the reel to the correct center line.

According to a preferred feature of the invention the apparatus is arranged in combination with transporter means for moving the prepared reels simultaneously from the preparation station to an unwind stand, the transporter unit having means for engaging and supporting the ends of each reel, while each support unit at the preparation station is arranged to engage the external wound surface of the reel.

The invention may be performed in various ways and a number of embodiments will now be described by way of example and with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatic side elevation of the whole apparatus, with parts omitted for clarity,

FIG. 2 is a side elevation, to a larger scale, of part of the loading section and preparation section, incorporating a separate weighing station,

FIG. 3 is a partial perspective view of a subsequent part of the preparation section,

FIG. 4 is an end elevation of the unwind section,

FIG. 5 is a perspective view of a cantilever arm assembly forming part of the unwind section,

FIG. 6 is a partial sectional view of the unwind section illustrating the removal of an empty core,

FIG. 7 is an end view of a modified form of preparation section, and

In the examples illustrated, the complete unwind stand system is in three sections; a loading section **10**, a preparation section **11** and an unwind section **12**. These sections are conveniently built as separate units and finally assembled to form one complete continuous assembly extending in an in-line manner parallel to the direction of web run-off to a subsequent automatic multiple cutter (not shown) to the right of the assembly shown in FIG. **1**. The cutter forms no part of the present invention and need not be described. It is, however, significant that the unwind assembly occupies little more lateral width, if any, than the cutter itself, so that a number of such assemblies can be arranged in parallel rows closely adjacent to one another, feeding a number of closely spaced cutting machines. The unwind assembly illustrated is designed to feed webs simultaneously from up to eight reels **14** having diameters up to 42 inches and varying widths between say 12 inches and 94 inches, arranged in two decks of four. The whole unwind assembly has continuous upper and lower levels to locate the reels at the two different heights.

The first, loading, section **10** comprises upper and lower inclined platforms **15**, **16** to receive fresh reels **14** delivered by a forklift loader, stacker truck or lift (not shown) at the loading end **17**. The reels **14** run down the inclined platforms **15**, **16** and are checked at the lower end by a double gate system of inclined chocks **18**, or plates or bars, which stop the reels and deliver them one by one as required to the next section **11**.

As delivered to the loading section **10**, the reels **14** usually have torn or otherwise useless outer windings, due to damage caused by mechanical handling. They are therefore delivered first to a cleaning station **24** also having upper and lower levels. At each level, the cleaning station **24** has a turntable **26**, whose diameter is equal to the width of the largest reel to be handled, recessed into a platform **28**. The turntable **26** may have a diametral recess **261** or a pair of ridges one each side of a diameter, to locate the reel on it.

In the modification illustrated in FIG. **2**, the reels first arrive at a separate weighing station **20** having upper and lower levels, at each of which is a small platform **21** supported on a load cell **22**. Each reel **14** in turn comes to rest on the platform **21** and its weight is registered by the load cell **22**. It is then rolled over platform **28** to the cleaning station **241** which in this embodiment comprises at each level a pair of horizontal support rollers **25** mounted on a turntable **262** attached to the top of a vertical hydraulic jack **27**. A fresh reel **14** is rolled manually in position over the two rollers **25** and the jack **27** is then elevated to the position shown in FIG. **2** to lift the reel above the level of the adjacent platforms **28**, **29** so that the turntable **262** can be

rotated through 90° and the reel **14** can be turned on the rollers **25**. The turntables **26** and **262** may be supported for rotation on their associated jack standards in the manner shown in U.S. Pat. No. 1,570,730.

With the reel in this position, with its axis parallel to the length of the apparatus, as shown on the upper level of the cleaning station **24** of FIG. **1** and the lower level of the cleaning station **241** of FIG. **2**, as many of the outer windings of the paper as may have been damaged are removed, and this waste material is delivered directly downwards into a collection bin (not shown) below and alongside the turntable. FIG. **7** illustrates a modification of the embodiment of FIG. **2**, in which a belt conveyor **242** is disposed alongside the cleaning station **241** to receive and remove waste material. FIG. **7** also shows lateral working platforms **243** with guard rails **244** for operators at the upper level.

Instead of having a separate weighing station **20**, the turntable **26** of FIG. **1**, or the turntable **262** or the jack **27** of FIG. **2**, may include weighing mechanism such as load cells to determine the initial weight of the reel and the weight when finally cleaned so as to check the amount of waste.

While supported on the turntable **26** or **262**, the reel **14** can also be turned through 180° about the vertical axis of the turntable, manually or by any desired power means, as may be necessary to ensure that the web pull-off will occur in the desired direction. When the reel **14** is ready, it is pushed off the turntable onto the platform, manually or by any desired power means the jack **27** being first lowered in the example of FIG. **2**, and it then continues into the next part of the preparation section **11**.

The next part of the preparation section **11** is an alignment station **30** which comprises two support platforms **31**, **32** one at each level, each platform having four reel positions. At each reel position there is provided a pair of supporting horizontal rollers **34** (FIGS. **1** and **3**) extending transversely to the longitudinal axis of the assembly. The two rollers **34** are mounted on shafts **35** rotatably supported at both ends in a transverse frame member **36**. The frame member is movable vertically within an aperture **33** in the platform **31** or **32** by means of a pair of screw jacks **37**, **38** operated through a cross-shaft **39** and gearing **40** by an electric motor **41**. When a reel **14** is received at one of the reel positions, an operator manipulates controls **42** to operate motor **41**, and this elevates the pair of rollers **34** by means of the jacks **37**, **38** to raise the reel center to the correct height for subsequent engagement with a pair of the shaftless heads, as described below. It will be appreciated that the diameters of the reels may vary so that the height of lift of the jacks must be variable. The operator can judge visually or can measure to determine when the reel center has reached the desired elevation, whereupon he shuts off motor **41**.

When all eight reels are correctly positioned in the alignment station **30**, the leading ends of the paper webs are pulled off the reels and led to the front reels on the upper and lower platforms **31**, **32** and secured to them ready for the subsequent changeover. No squaring rollers are provided and therefore no web threading operations are necessary.

The unwind section **12** comprises an open frame **45** easily accessible from both sides and from opposite ends. Within this frame, and extending also into the preparation section **11**, are mounted two parallel horizontal longitudinal rails **46** (FIGS. **1** and **4**) guiding a movable transporter **47** which also acts as an unwind stand. The transporter **47** comprises four parallel heavy rigid upright tubes **48** (FIG. **4**) arranged in a longitudinal row and attached at their upper ends to a horizontal framework **49** having rollers **50** longitudinally spaced along both opposite sides, running on the longitudinal rails **46**. The lower ends of the tubes **48** are attached to a lower horizontal beam **51** carrying heeling rollers **52** on vertical axes engaging a fixed heeling rail **53** mounted at the bottom of the main frame. Each vertical tube **48** supports two identical cantilever arm assemblies **54**, **55** at heights corresponding respectively to the two levels at which the reels **14** are handled. Each cantilever arm assembly comprises a pivotal collar **56** closely located around the tube **48** and bearing on a fixed positioning collar **57** secured to the tube, so that the pivotal collar **56** is capable of pivotal movement about the tube axis. From each pivotal collar **56** project two parallel horizontal carrier tubes **58**, and on these tubes two brackets **59**, **60** are mounted by means of sleeves **61**, **62** slidable on the carrier tubes **58**. Each bracket **59**, **60** has a depending plate or lug **63**, **64** carrying at its lower end an expanding type shaftless head **65**, **66** for engaging one end of a reel core **72**. The two brackets **59**, **60** with the attached heads **65**, **66** are movable towards and away from one another, symmetrically, by means of a lead screw **67** (FIG. **5**) having threads of opposite hand enclosed within gaiters **68**, **69** and engaging in the brackets **59**, **60**. The lead screw **67** is parallel with the carrier tubes **58** and is rotatable by means of an individual geared motor drive (not shown) to draw the brackets **59**, **60** together or to move them apart.

Each expanding shaftless head **65**, **66** includes a stub shaft **70**, **71** projecting towards the opposite head and capable of entering into the respective open end of the reel core **72**.

Each head **65**, **66** also includes braking means **73**, **74** (FIGS. **4** to **6**) to control the run-off web tension. It may further include automatic core ejector or push-off devices (not shown) to ensure that a reel core **72** will be discharged from both ends when the two heads **65**, **66** are separated at the finish of an unwind operation. Alternatively, means indicated diagrammatically at **86** in FIG. **6** may be provided for gripping the mid-portion of the reel core **72** when the heads **65**, **66** are being separated.

Each complete cantilever arm assembly **54**, **55** including its two shaftless heads **65**, **66** can be pivoted about the axis of the respective vertical tube **48** in order to adjust the reel axis in a horizontal plane in relation to the web run-off direction so as to compensate for conical tapering of the wound reel **14**. This squaring adjustment may be achieved by a screwthreaded adjusting rod **75** (FIG. **5**) pivotally attached at one end to a fixed anchor bracket **76** on the vertical tube **48** and engaging a screwthreaded collar **77** attached to one of the carrier tubes **58**. The shaft **75** may be manually rotated in either direction by means of a hand-wheel **78** to cause the cantilever arm assembly **54** or **55** to pivot through a limited angle about the vertical axis. It will be noted that the heads **65**, **66**

will remain aligned coaxially with one another during this pivotal adjustment.

Each cantilever arm assembly **54, 55** is designed to be capable of supporting the weight of a wound reel **14**, i.e. 2 tons or more, but in the actual unwinding operation it may be desirable that the free end of the cantilever arm assembly should be additionally supported or clamped, if only to reduce vibration. For this purpose the outer bracket **59** at the free end of the assembly may have a roller **79** designed to run on a horizontal track (not shown) supported by another part of the main open frame **45** and braking means such as a friction clamping pad or a magnetic bracket (not shown) may be provided to lock or clamp this outer end of the cantilever assembly.

It will be seen that this system provides the advantages of shaftless heads and also provides for so-called squaring adjustment while maintaining the axes of the two heads in alignment. Moreover the arrangement of cantilever supports for the shaftless heads provides other advantages in association with the transporter system for moving fresh reels into position, as will become apparent.

As explained above it is also important to provide means for rapidly removing empty reel cores **72**, or partly unwound reels, and in such a manner that the cores or partly unwound reels will not cause damage or injury. Accordingly the open frame **45** at the unwind station **12** also includes means for supporting two clearing platforms **80, 81** (FIG. 4) in cantilever manner from the side thereof opposite that from which the cantilever arm assemblies **54, 55** extend from the vertical tubes **48** of the transporter **47**. Each clearing platform **80, 81** extends the full length of the unwind station **12** and in their normal positions the platforms are positioned a short distance below the reels **14** in each level. The platforms are maintained in the horizontal position by rollers **82** engaging opposite sides of a vertical guide rail **83**. Each platform **80, 81** is vertically movable by means of a power operated hoisting system shown diagrammatically in the case of platform **80** as comprising a cable **84** passing over a pulley **85** and wound on a power-driven winch (not shown) in housing **86** for selective actuation by the operator. In this way, platforms **80** and **81** can be raised to meet and support any partly unwound reel to be removed from the unwind stand. This may occur, for example, if one reel has a defective web in which case it is normal to cut the web and continue winding from the remaining reels until the next changeover. The defective reel must, of course, be removed before a fresh reel can be inserted and the defective reel may weigh up to the full initial weight of a wound reel.

Since the clearing platforms **80, 81** are arranged as cantilevers projecting in the opposite direction from the cantilever arm assemblies **54, 55** supporting the shaftless heads on the transporter **47**, the complete transporter can be moved longitudinally between the unwind station **12** and preparation station **11** without conflicting with the clearing platforms. Moreover, when the transporter **47** is out of the unwind station **12** the platforms **80, 81** can both be moved vertically. In use, at the end of an unwinding operation, the two platforms **80, 81** are raised to meet and support any partly unwound reels, the pairs of shaftless heads **65, 66** are moved apart by the lead screw **67** under remote control means to disengage from the reel cores **72** and to drop any empty core centers on to the platforms **80, 81** and the transporter **47** is then moved out of the unwind station **12** to pick up eight fresh reels **14** from the preparation station **11**. When the transporter **47** is clear of the unwind station **12** the lower clearing platform **81** can be cleared of empty reel cores and any "broken-out" reels. The upper clearing platform **80** is then lowered down on to the lower platform **81** and cleared in the same manner. The two platforms are then returned to their original positions before the transporter **47** returns to the unwind station **12** and interlocks are provided to prevent the return of the transporter until the platforms are correctly positioned.

At the preparation station **11** the two stationary platforms **31, 32** supporting the fresh reels **14** are similarly mounted in cantilever fashion on the same side as the clearing platforms **80, 81** so that the transporter **47** with its cantilever arm assemblies **54, 55** supporting the shaftless heads **65, 66** can interleave as it enters this area longitudinally. The fresh reels **14** have previously been aligned correctly as explained above so that each pair of shaftless heads **65, 66** can be engaged rapidly in the ends of each core center **72**, whereupon the pairs of support rollers **34** at each reel station are retracted, leaving the reels **14** supported entirely by the transporter **47**. The transporter **47** is then returned rapidly to the unwind station **12** by suitable power operated mechanism (not shown). An operator then picks up the four gathered web ends fastened to the front reel at each level and introduces them to the automatic cutting machine. It is anticipated that the total changeover time may be of the order of 5 minutes or less, i.e., of approximately the same duration as the time taken to reset the cutter machine itself, if such resetting is necessary. Unless difficulties are encountered in disposing of the reel cores and broken-out reels the excess downtime may be greatly reduced or completely eliminated. Moreover the disposal of the heavy defective reels can be performed rapidly and under complete control, almost entirely eliminating any dangerous manual operations. The system avoids the use of squaring rollers which can only be threaded when the reels are in the unwind area and which, therefore, tend to increase the downtime.

The systems described above avoid the need for duplicate shaftless heads at the unwind and preparation stations, which would occur with a turntable arrangement, and thus considerably reduce the overall cost of the equipment. The whole assembly can be arranged in line with each cutting machine and occupies little or no greater width than the cutting machine itself so that banks of cutting machines can be arranged closely adjacent one another, or the unwind stands may be provided in alignment with existing cutting machines positioned in this manner, without the need to re-site the machines. The loading arrangements are greatly simplified since loading is performed at one end only, e.g., by a forklift or stacker truck or by a lift, and thereafter the graded incline along the machine to the preparation station facilitates the maneuvering of the reels into position.

I claim:

1. Apparatus for preparing a plurality of wound reels of sheet material for a subsequent unwind operation, including at least one platform, at least two reel receiving stations on each platform, each platform providing a path for reels to be rolled in one direction to said receiving stations, and each reel receiving station comprising a reel support for engaging a reel solely by the external wound surface thereof, and means for raising and lowering said support between a position below the surface of the platform and a selected height above said platform surface which permits axial adjustment of a supported reel held clear of said surface.

2. Apparatus as claimed in claim 1, wherein each said reel support includes a pair of rollers, parallel to the reel axis, which cradle the reel.

3. Apparatus as claimed in claim 1, wherein each platform has an array of reel receiving stations spaced in said one direction.

4. Apparatus as claimed in claim 1, and including means located upstream of the platform for rotating each reel about a substantially vertical axis, while supporting that reel for rotation about its own axis.

* * * * *