

[54] APPARATUS FOR JOINING
CONTINUOUSLY MOVING WEB
MATERIAL

[76] Inventor: Basil Scott Crone, 30 Stamford Rd.,
Bowdon, Cheshire, England

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[58] Field of Search..... 242/58.1, 58.2, 58.3,
242/58.4, 58.5

[56] References Cited
UNITED STATES PATENTS

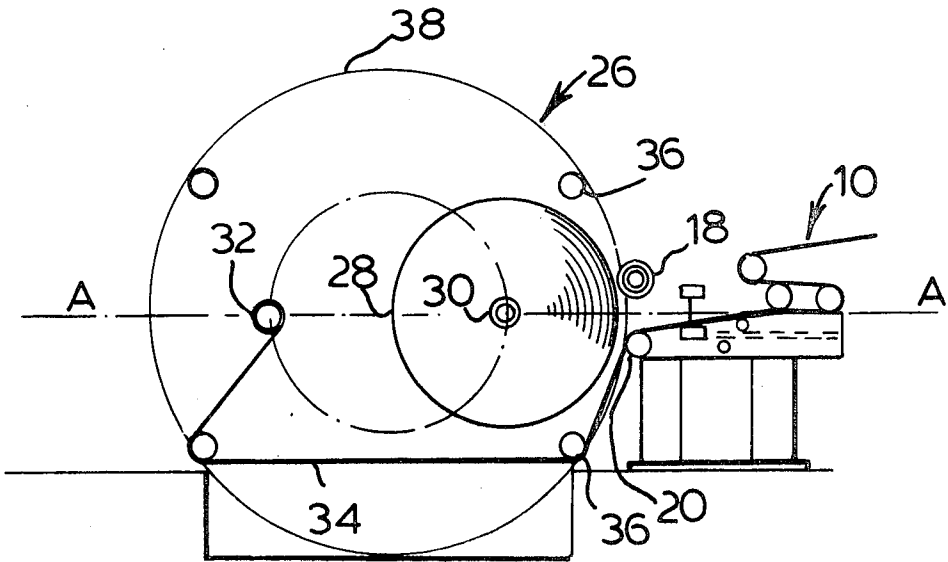
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Primary Examiner—George F. Mautz
Assistant Examiner—Edward J. McCarthy
Attorney—Scrivener, Parker, Scrivener & Clarke

[57] ABSTRACT

The invention provides an apparatus for joining or splicing a first continuously moving web to a second web. This comprises a displaceable roller and an accelerating roller, the functions of which are interchangeable, the accelerating roller serving to accelerate the second web to a speed commensurate with the speed of the first web. The displaceable roller may then be displaced to bring the first and second web into pressure contact to allow joining. In a preferred form both webs are supplied from reels carried on a reelstand and the second web may be joined to the first web unwinding in either sense without braking the continuity of flow, from a reel also unwinding in either sense.

6 Claims, 4 Drawing Figures



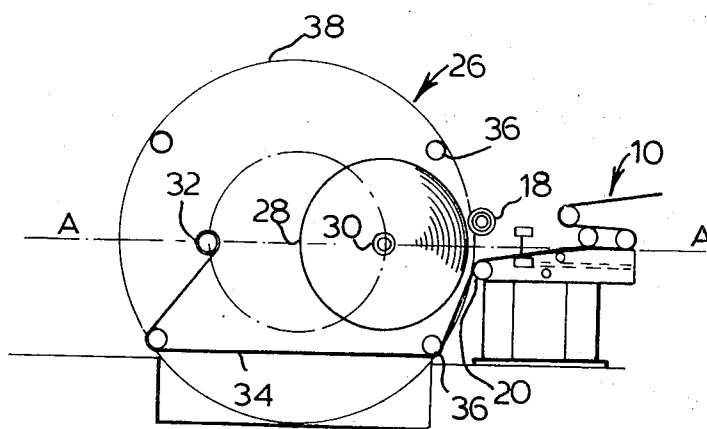


FIG. 1.

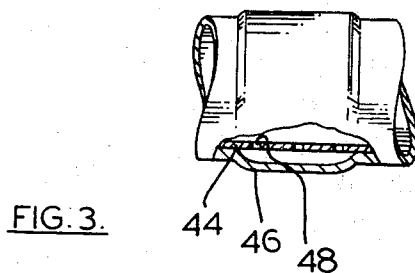


FIG. 3.

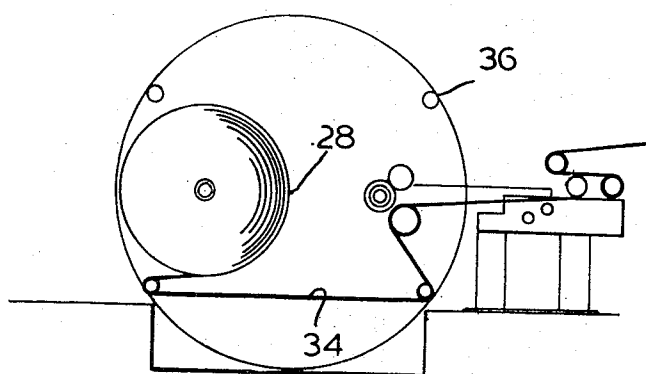


FIG. 4.

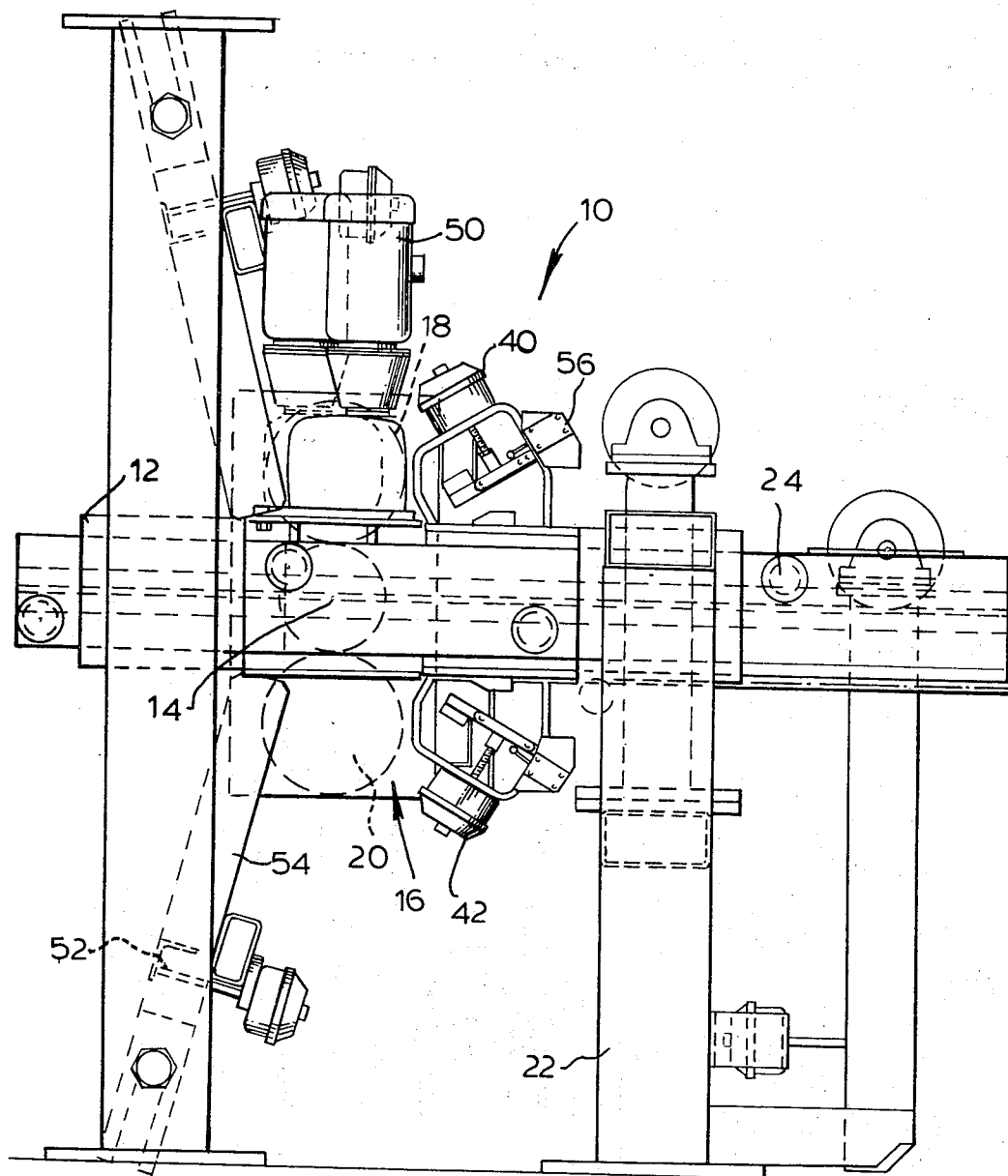


FIG. 2.

APPARATUS FOR JOINING CONTINUOUSLY MOVING WEB MATERIAL

This invention relates to an apparatus for joining continuously moving web material and in particular to apparatus for joining a first web of material from a reel onto a second, continuously moving, web.

In the processing of continuous web materials, the material is customarily supplied to the process plant in the form of a wound roll or reel. So that the delivery of the web material to the process should be continuous and uniform it is desirable to join the leading end of a new reel of the web material to the trailing or running end of the unwound or unwinding reel without disturbing the delivery of the web material to the process. It is also desirable in cases where the reels of material vary in size, and on the qualities required for the process, to be able to extract a reel when only partly unwound and to substitute another reel, again without disturbing the delivery of the material to the process. Further, in cases where the material has significantly different characteristics for the process on its two sides and the material cannot be supplied with all reels wound in the same sense (that is, with the side of a given characteristic always facing inwards or with that side always facing outwards,) it is desirable in addition to the above desiderata to be able to unwind any reel in either rotational sense, so that the side of preferred characteristics is always presented to the process in the same attitude irrespective of the sense in which supplied reels were wound.

For the purpose of successively unwinding reels with the least loss of time, such reels are customarily supported on an unwinding device in which pairs of arms extend radially from a horizontal pivoting centre and rotatably support one reel at the end of each pair of arms. The invention may be used in conjunction with such unwinding devices, commonly known as "turnover unwinds," "turret unwinds," "turnover reelstands," or "turret reelstands," but is not limited to any particular one. For the purposes of describing the invention the unwinding device with which it co-operates will hereinafter be described as a "turret reelstand," or, where the meaning will be clear, as "reelstands."

According to one aspect of the present invention there is provided an apparatus for joining a first continuously moving web to a second web, one of said webs having an adhesive coating thereon, which comprises a displaceable roller over which the first web is adapted to pass, a drive roller connectible to a drive for displacing the second web at a speed commensurate with the first web at a location in the path of said displaceable roller, and means for displacing the displaceable roller to bring the two webs into pressure contact to permit the adhesive to unite the two webs, the function of the said rollers being interchangeable whereby the displaceable roller is capable of carrying the second web and is connectible to a drive for displacing the second web at a speed commensurate with the first web and the drive roller is capable of carrying the first web and is displaceable to displace the first web to unite the two webs.

According to a second aspect of the present invention there is provided an apparatus for joining a first continuously moving web to a second web which comprises a pair of rollers rotatably mounted on a yoke which is pivotably secured to a movable carriage and

selectively movable between two angular positions, at least one roller having at least one axial portion expandible to a diameter greater than that of the remainder of the roller and being selectively connectible to a drive motor or the other roller.

According to a third aspect of the invention there is provided a method of joining a first continuously moving web to a second web one of said webs having an adhesive coating thereon, which comprises passing the first web over a displaceable roller, moving the second web by means of a drive roller at a speed commensurate with the speed of the first web in the path of the displaceable roller and displacing the displaceable roller to bring the two webs into pressure contact to permit the adhesive to unite the two webs.

The apparatus of the invention is intended to be used in conjunction with a turnover reelstand on which a reel is unwinding, providing the continuously moving web, and a web carried on a second reel is to be joined to the moving web. To facilitate the operation of the apparatus, the reelstand should carry four idler rollers symmetrically placed, two adjacent each reel, just within the swept circle produced by revolving the reelstand carrying the largest reel it is capable of carrying.

It is an advantage of the apparatus of the invention that the drive and displaceable rollers are interchangeable in function, i.e., the drive roller can be used to displace the continuously moving web, in which case the displaceable roller is used to drive the second web to a speed commensurate with the moving web. Thus the moving web may be fed into the apparatus passing over either of the rollers, the other being used to accelerate the second web. When the apparatus is used with a reelstand, as described above, the roller which is to carry the moving web may be chosen so that the other roller drives the second web, carried on a reel in the desired sense of rotation.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatic side elevation of an embodiment of the invention together with a reelstand having two pairs of radial arms carrying on unwinding reel and a fresh reel;

FIG. 2 is more detailed view of the apparatus of FIG. 1;

FIG. 3 a view, partly in section of a roller; and
FIG. 4 a view similar to FIG. 1 in which an exhausted reel has just been superseded.

Referring to the drawings, an apparatus generally designated 10 comprises a carriage 12 having pivotably mounted at 14 a yoke 16 carrying a pair of rollers 18, 20. The carriage 12 is movably mounted on a rigid framework 22 which carries rollers 24 which co-operate with a track on the carriage to enable it to traverse the framework. A motor and braking system (not shown) are provided to move and lock the carriage relative to the framework. An "S & S" turret reelstand 26 (shown diagrammatically in FIG. 1) is positioned adjacent the apparatus 10. The reelstand 26 has two pairs of opposed radial arms pivoted at 28, each pair of arms carrying a reel 30, 32 at their outer extremities. In FIG. 1 the reel 32 is unwinding and almost exhausted and the reel 30 has not yet been joined to moving web 34. The reelstand 26 is adapted by the provision of four idler rollers 36 located within the swept circle 38 produced by revolving the radial arms carrying the largest

reel they are capable of holding about the centre of piv-
 otting 28. The idler rollers 36 are mounted from the ra-
 dial arms and rotate therewith, each roller 36 being
 able to freely revolve about its own axis. The rollers in
 each pair of idler rollers associated with each reel are
 spaced apart by a distance sufficient to allow the largest
 reel to be unwound to be entered between a pair of roll-
 ers and mounted on the corresponding radial arm. The
 reelstand shown in FIG. 1 is in the position wherein the
 radial arms are horizontal and plane A—A through the
 axes of the reels 30, 32 is therefore horizontal.

Pneumatic actuators 40, 42 are located on the car-
 riage 12 and are operable to rock the yoke 16 about its
 pivot 14 by selectively pressurizing one actuator whilst
 exhausting the other. When neither actuator is operat-
 ing, the rollers 18, 20 are symmetrically disposed about
 the plane A—A the distance from the axis of the roller
 to the plane A—A being between 25 and 35 percent of
 the radius of the largest reel which can be accommo-
 dated by the reelstand 26.

From FIG. 3 it can be seen that each roller 18, 20 is
 constructed from a rigid support tube 44 covered by an
 elastomeric sleeve 46. The sleeve 46 is bonded to the
 tube 44 except in two axial portions symmetrically dis-
 posed on either side of the centre of the roller. In these
 unbonded portions, the tube 44 has air holes 48 to
 allow air to be introduced between the sleeve and the
 tube thus inflating the two unbonded portions. Air,
 under pressure, may be introduced via a passageway
 formed axially through the bearing journal at either or
 both ends of the roller, in a known manner, and thus
 the unbonded portions may be inflated while the roller
 is rotating.

Motors 50 are provided on the carriage 12 which are
 operable to selectively rotate either or both of the roll-
 ers 18, 20 in either sense. Pneumatically operable cut-
 ting edges 52 are mounted above and below the car-
 riage 12 on pivotably mounted swinging arms 54.

In order to illustrate the operation of the apparatus
 its use will be described in relation to the sequence of
 events during the joining of a succeeding reel to the
 web unwinding from a preceding reel, which has almost
 completely unwound. As reel 32 is unwinding it will be
 in the position that reel 30 is shown in FIG. 1, feeding
 the web 34 directly into the apparatus without touching
 any of the idler rollers 36. As the reel 30 is unwinding
 a fresh reel 32 may be loaded onto the other arm of the
 reelstand. When it is desired to commence the joining
 operation the reelstand is rotated clockwise through
 180° about pivot 28, the web 34 automatically being
 taken up on the appropriate idler rollers 36, to give the
 configuration illustrated in FIG. 1, i.e., with the un-
 winding reel on the left. The carriage 12 is now tra-
 versed from a rest position, well clear of the reelstand,
 towards the fresh reel 30.

The inflatable portions of the roller 18 are inflated as
 the carriage 12 is moving and the yoke tilted anticlock-
 wise, thus this roller will contact the reel 30 and act as
 an accelerator roller. As roller 18 abuts against the
 reel, the yoke 16 will pivot a small amount about its
 pivot 14 back towards its mean position actuating an
 electrical limit switch 56 to operate motor 50 to drive
 roller 18 in a clockwise direction and therefore drive
 reel 30 in an anticlockwise direction. In this position
 the clearance between the web 34, passing over roller
 20, and reel 30 is about three-fourths inch. When the
 surface speed of the reel 30 exceeds the speed of the

web 34 the motor 50 is automatically disconnected
 from the roller 18 and the latter is connected to roller
 20 through a one-way drive element so that the speed
 of roller 18 will fall to match that of roller 20 and thus
 the surface speed of reel 30 will match the speed of the
 web 34. The reel 30 carries an axial band of adhesive
 on its outer surface adjacent the loading edge of its web
 which is lightly fixed to the surface of the reel. The
 band of adhesive is not continuous but has two breaks
 therein corresponding to the inflatable portions of the
 roller 18 and all through the sequence so far the reel 30
 is driven by the inflated flexible portions of the roller
 18 which contact corresponding portions of the reel 30
 which are free from adhesive.

When it is desired to effect the joining, the pneumatic
 cylinder 40 is pressurised and cylinder 42 exhausted
 thereby causing the yoke 16 to pivot clockwise when
 the roller 20, operating as a pressure roller will press
 the running web 34 against the reel 30 over the whole
 width thereof as the inflatable portions of roller 20 are
 not inflated. When the leading edge of reel 30 passes
 the nip formed by roller 20 and reel 30, the adhesive
 band adjacent thereto causes the web of the reel 30 to
 adhere to the running web 34, breaking the light adhe-
 sion of the web to the reel 30. The pneumatic cutting
 edge 52 is thereafter actuated to sever the running web
 34 allowing a single ply web from reel 30 to pass
 through the apparatus and onto any further processing
 stage.

The foregoing sequence describes the joining of a
 large succeeding reel to the end of a fully unwound reel
 rotating in the opposite sense. The apparatus may also
 be used to join a succeeding reel of minimum diameter
 to a web running from a preceding reel of maximum di-
 ameter, the reels rotating in opposite senses. This situa-
 tion is shown in FIG. 4. In the event of the required di-
 rection of unwinding of the succeeding reel being
 clockwise, the sequence of the joining events is as here-
 inbefore described, but the actions of the parts are ex-
 changed top for bottom, i.e., the moving webs 34
 passes over the upper idler rollers, the reelstand having
 been rotated through 180° anticlockwise. This inverse
 sequence is programmed by the operator selecting di-
 rect or inverse sequencing.

The preferred embodiment of the invention de-
 scribed supra thus provides a system of pressure rollers
 and guide rollers and their supports for the purpose of
 joining the leading ends of a series of wound reels of
 continuous web material each in succession to the trail-
 ing end of the reel preceding it in the course of feeding
 the reels into a continuous processing plant, in such a
 way that the continuity of the processing is not dis-
 turbed, and in such a way that reels of widely varying
 sizes can succeed one another, and in such a way that
 successive reels may be unwound in either sense of ro-
 tation, irrespective of the sense of rotation of unwind-
 ing the preceding reel, and in such a way that any size
 of reel in a wide range of sizes of reels can be stopped
 unwinding and substituted by the next reel to be un-
 wound, all without disturbing the continuity of the pro-
 cess.

I claim:

1. An apparatus for joining a web from a reel to a
 continuously moving web, the web from the reel having
 an adhesive on at least part of the outer periphery
 thereof, said apparatus comprising:
 a reelstand,

means mounting said reelstand for rotation,
 two reel support spindles mounted on said reelstand
 on a first radius thereof, one of said spindles carry-
 ing a reel from which the continuously moving web
 is unwinding and the other spindle carrying a reel 5
 having the adhesive,
 a pair of circumferentially spaced idler rollers
 mounted on said reelstand and associated with
 each reel support spindle,
 a carriage arranged for movement between a re- 10
 tracted position in which the carriage lies displaced
 from said reelstand and an operative position in
 which the carriage lies adjacent said reelstand,
 a yoke mounted for pivotal movement on said car-
 riage, 15
 a pair of rollers mounted on said yoke and equally
 spaced apart about the pivot position, both rollers
 including at least one axial portion expansible to a
 diameter greater than that of the remainder of the
 roller, one roller carrying and being driven by the 20
 continuously moving web and acting as a pressure
 roller when said carriage occupies said operative
 position and the other of said rollers being ar-
 ranged to be inflated and driven to act as an accel-
 erator roller for said reel when said carriage occu- 25
 pies said operative position whereby to rotate said
 reel from a stationary condition up to a peripheral
 speed commensurate with that of the moving web

and the pressure roller being arranged to be dis-
 placed to force the continuously moving web
 against said reel to cause the adhesive on the reel
 web to adhere to the continuously moving web, the
 function of the pressure and accelerator rollers
 being interchangeable to enable webs of oppositely
 handed rolls to be joined to the continuously mov-
 ing web.

2. An apparatus as set forth in claim 1 wherein said
 reelstand comprises a turret reelstand.

3. An apparatus as set forth in claim 1 including a
 motor, and means for selectively driving said accelera-
 tor roller by said motor or by said pressure roller.

4. An apparatus as set forth in claim 1 wherein said 15
 rollers comprises a rigid support tube carrying an elas-
 tomeric sleeve bonded thereto in such a manner that
 two axial portions symmetrically disposed about the
 centre of the roller are free to expand, the tube having
 air passages through its walls in the vicinity of the ex-
 pansible portions of the sleeves.

5. An apparatus as set forth in claim 16 wherein said
 yoke includes a pair of arms and wherein said accelera-
 tor roller and said pressure roller are carried one on
 each arm of said yoke.

6. An apparatus as set forth in claim 5 which addi-
 tionally comprises at least one pneumatic actuator for
 pivotally moving said yoke.

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