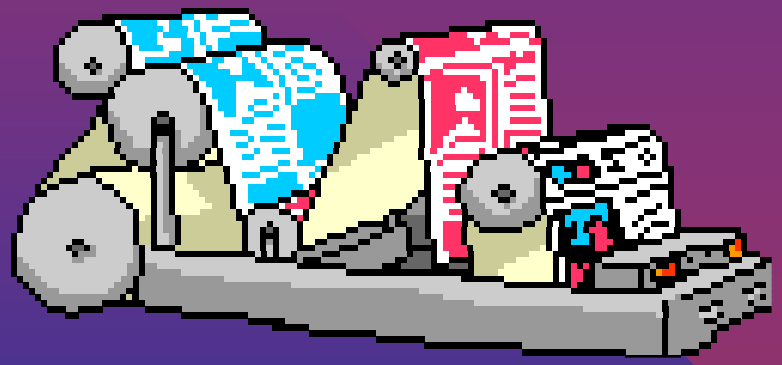
SCRAPLESS WINDING

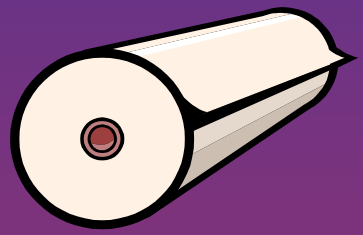
OF THIN FILMS



By CHUCK BAILEY
FAUSTEL, INC

or

TAKING THE ART OUT of WINDING GOOD ROLLS *



*REFERENCE: PAPER BY R. DUANE SMITH, "THE ART OF WINDING GOOD ROLLS"

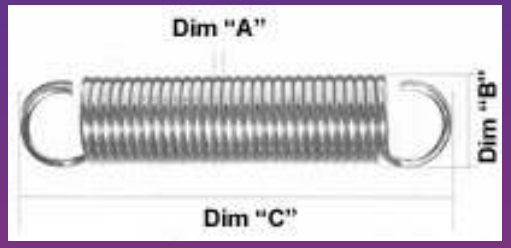
ROLL QUALITY

- All of us involved in making, processing or using films know of the critical importance of making good quality rolls and minimizing or eliminating scrap.

- Building rolls of good to excellent quality without waste is everyone's goal.
- Scrap is costly – and not very pretty
- Environmentally unfriendly

TYPICALLY, A WEB THAT IS TO BE WOUND UP MUST HAVE CERTAIN CHARACTERISTICS:

- **PROPER TENSION**



- **NO WRINKLES**

- **GOOD PROFILE**

OUR DISCUSSIONS TODAY ARE CONCERNED PRIMARILY WITH WINDING OF THIN FILMS – LOOSELY DEFINED AS LESS THAN 3 MILS.

SCRAPLESS WINDING

THE FIRST STEP IN ACHIEVING SCRAPLESS WINDING IS TO MAKE GOOD ROLLS –

as my friend Duane Smith says,

SCRAPLESS WINDING

TO CONSISTENTLY WIND
DYNAMITE ROLLS YOU NEED:

TNT

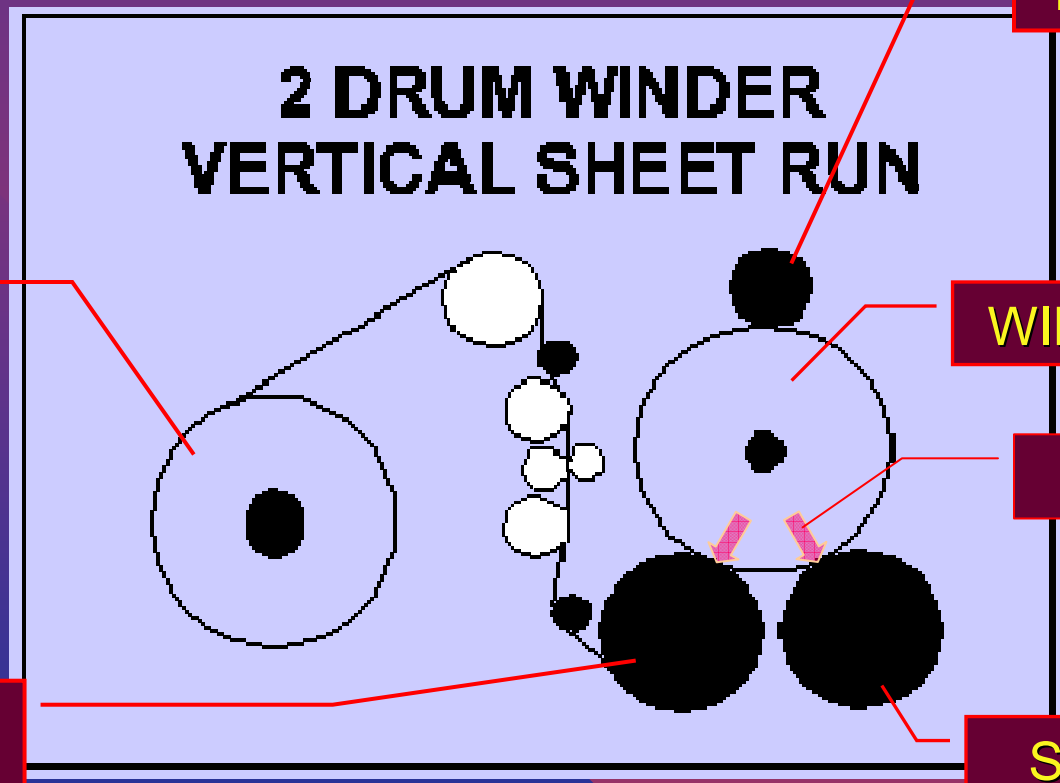
TNT

T = TENSION

N = NIP

T = TORQUE

To illustrate TNT, let's take the example of two drum winders as used in the paper industry:



RIDER ROLL

NIP

UNWIND

TENSION

WINDING ROLL

DRUMS

NIP

FIRST OR REAR DRUM

TENSION

SECOND OR FRONT DRUM

TORQUE

- T - TENSION -- FIRST DRUM PULLING AGAINST THE UNWIND BRAKE

- N – NIP FORCE -- RIDER ROLL INITIALLY, AND AS THE WINDING ROLL BUILDS, BY THE WEIGHT OF THE ROLL ACTING ON THE DRUMS.

- T – TORQUE – SECOND DRUM OVERSPEEDS, TIGHTENING ROLL

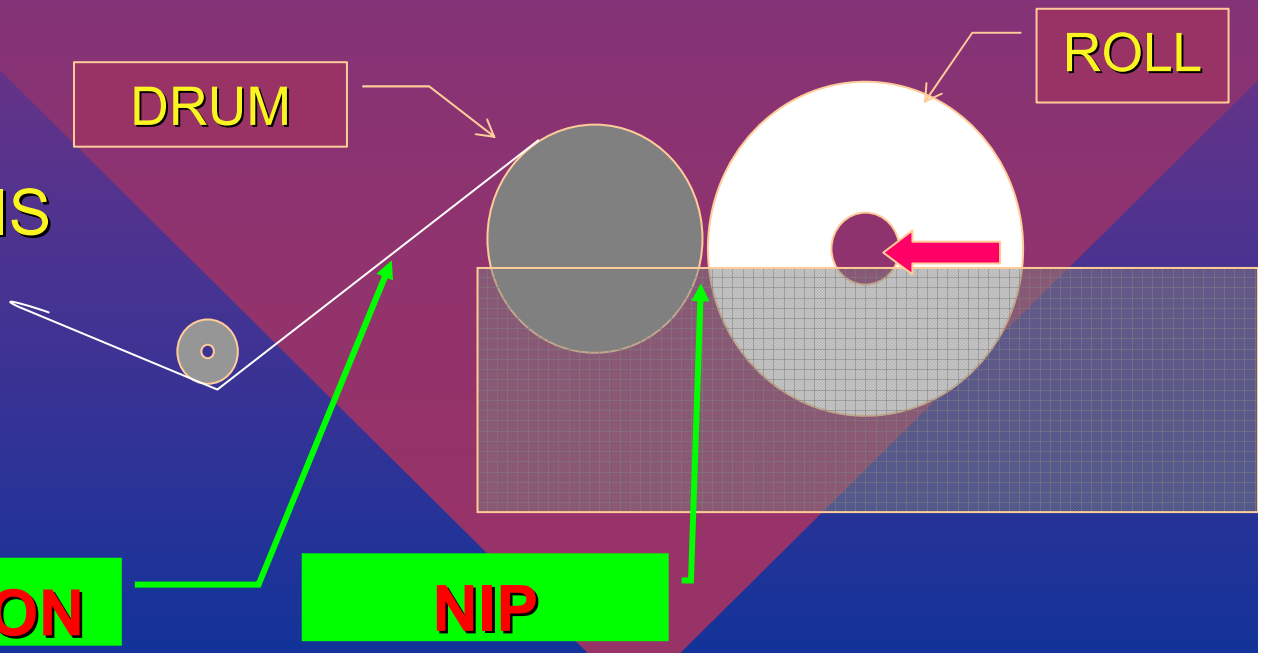
- THEREFORE, ALL THE PARAMETERS OF *TNT* ARE FULLY UTILIZED ON TWO-DRUM WINDERS

ELEMENTARY WINDING

- THE SIMPLEST FORM OF WINDING IS SURFACE WINDING WITH A SINGLE DRUM

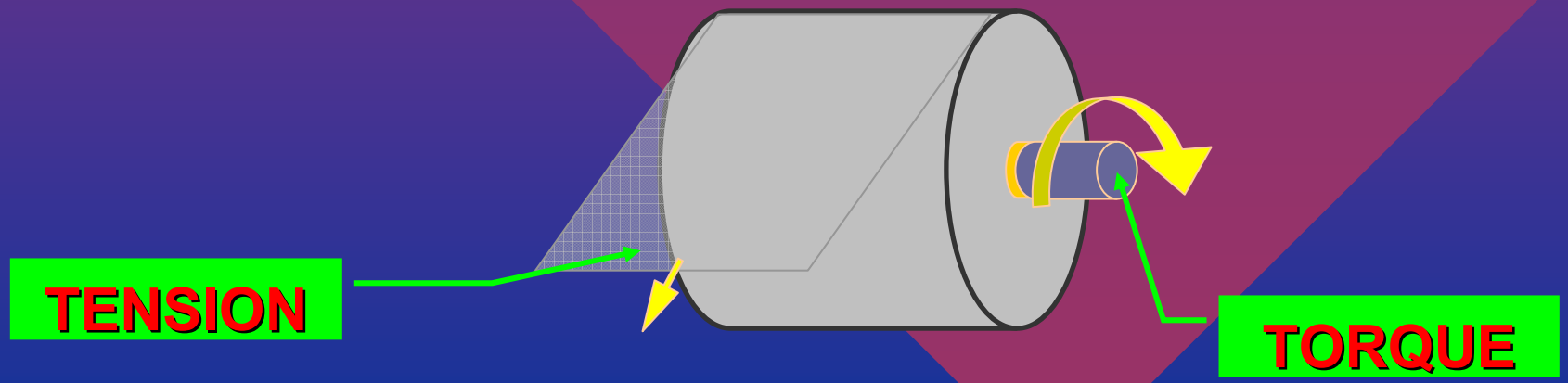
- NIP PRESSURE IS THE DOMINANT PARAMETER

"POPE REEL" – SINGLE DRUM SURFACE WINDER



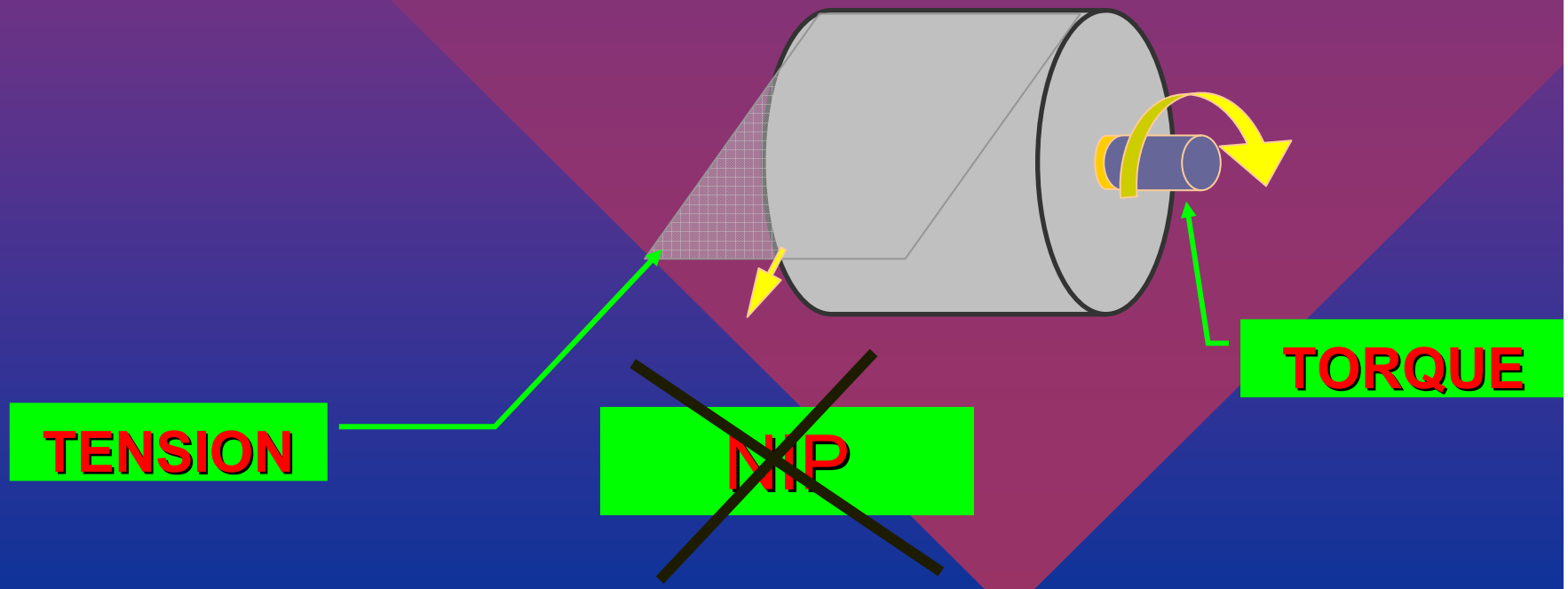
COMPARE TWO DRUM WINDERS TO A SIMPLE **CENTER WINDER**

- WINDING TORQUE IS DEVELOPED BY DRIVING THE CENTER OF THE ROLL/CORE.
- TENSION IS DEVELOPED BY CONVERTING TORQUE TO A LINEAR FORCE AT THE OUTER WRAP OF THE ROLL AS THE WEB PULLS AGAINST A RETARDING FORCE



COMPARE TWO DRUM WINDERS TO A SIMPLE **CENTER WINDER**

- CENTER WINDING APPLIES TENSION ONLY
- A LAY-ON ROLL IS NOT USED
- NIP FORCE IS NOT AVAILABLE

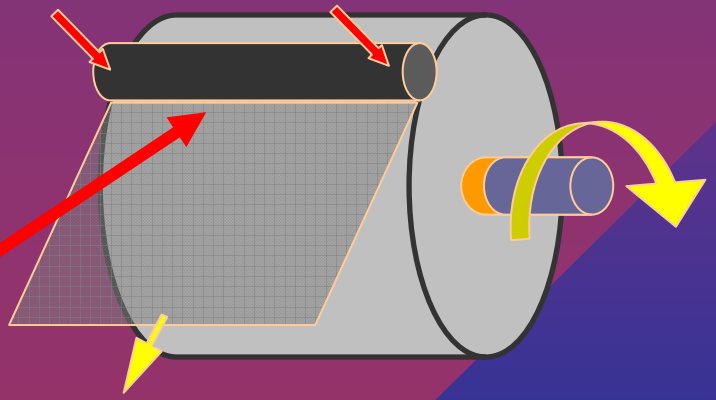


CENTER WINDER

- CENTER WINDING WORKS OKAY
  - WHEN WINDING SMALL ROLLS AT RELATIVELY SLOW SPEEDS.
  - IF THE WEB INTERLAYER FRICTION IS RELATIVELY HIGH
  - BUILD-UPS ARE SMALL (OD/ID)

CENTER WINDER WITH NIP

- CENTER WINDING WITH NIP, OR A LAYON ROLL, IMPROVES WINDING BY ADDING NIP FORCE FOR DENSITY CONTROL.
- AT HIGHER SPEEDS, THE NIP ROLL SQUEEZES SOME AIR OUT OF WINDING ROLL
- ONLY TWO PARAMETERS ARE USED:



TENSION and NIP.

(AGAIN, TENSION CREATED BY CENTERWIND TORQUE)

CENTER WINDING WITH SURFACE ASSIST or SURFACE WINDING WITH CENTER ASSIST

- BY ADDING A DRIVEN NIP ROLL, THE WINDING PROCESS IS FURTHER IMPROVED.
- TENSION IS PROVIDED BY THE DRIVEN LAY-ON ROLL (PULLING AGAINST AN UPSTREAM NIP OR BRAKE)
- NIP IS PROVIDED BY THE LAY-ON ROLL
- TORQUE IS PROVIDED BY CENTER WINDING

ACHIEVING TNT IN WINDING OF THIN FILMS

- CENTER WINDING –

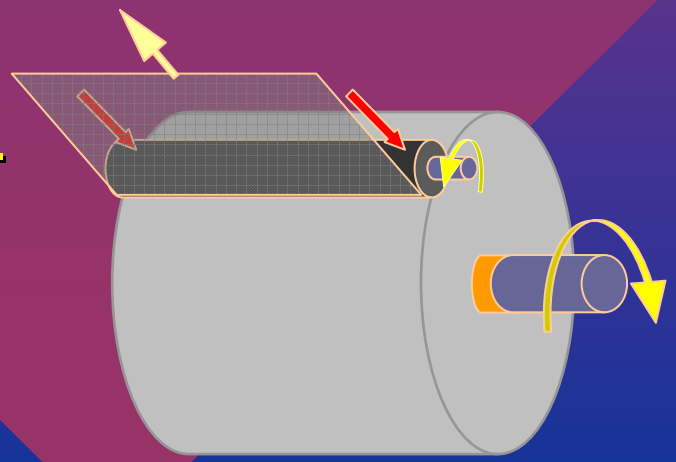
  TORQUE

- SURFACE ASSIST-

  TENSION

- LAYON PRESSURE-

  NIP



THROUGH ***TNT*** WE HAVE THE TOOLS TO ENABLE BUILDING ROLLS OF EXCELLENT QUALITY BY

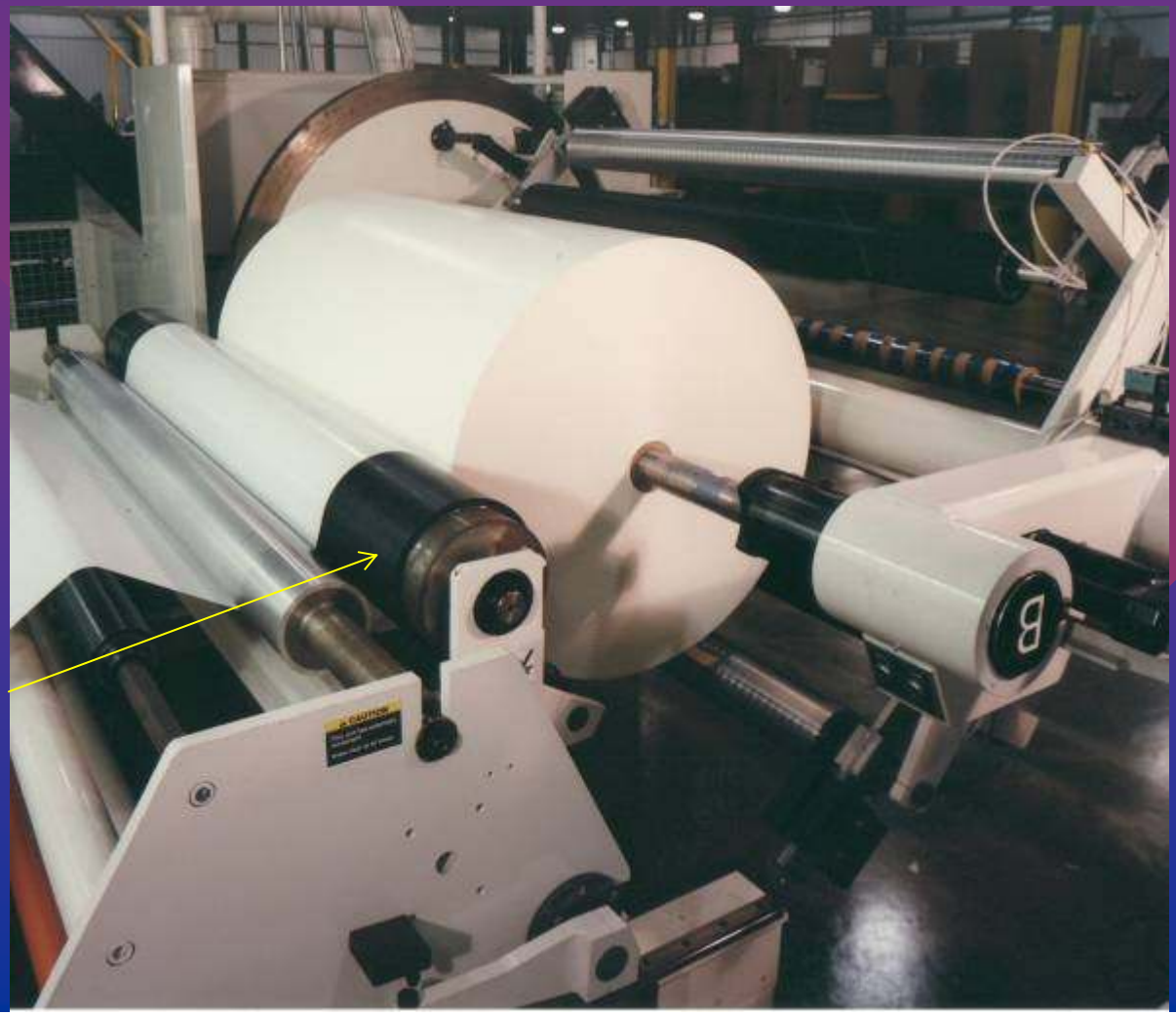
- ROLL DENSITY CONTROL AND THEREFORE, ROLL HARDNESS
- "WOUND-IN" TENSION CONTROL

(TOO MUCH CENTER TORQUE NEEDED FOR ADEQUATE TENSION)

TNT

- CONTROLLING THE THREE PARAMETERS….
- *ALLOWS THE PROCESSOR TO BUILD A "PERFECT" ROLL*

EXAMPLE OF A TURRET WINDER WITH A LAYON ROLLER



Lay-on Roller
Non driven

FOR THIN FILMS:

- CENTER-SURFACE - or
- SURFACE-CENTER WINDING
- WITH NIP PRESSURE
- UTILIZING ***TNT*** PARAMETERS
- "PROGRAMMED CONTROL" OF ***TNT*** TOOLS ENABLES THE BEST IN WINDING.

CAN WIND *NEARLY* "SCRAPLESS".

OTHER FACTORS NEED TO BE CONSIDERED TO ACHIEVE SCRAPLESS WINDING :

- NO “FOLD-BACK” AT THE CORE
- ELIMINATION OF POORLY WOUND OUTER WRAPS

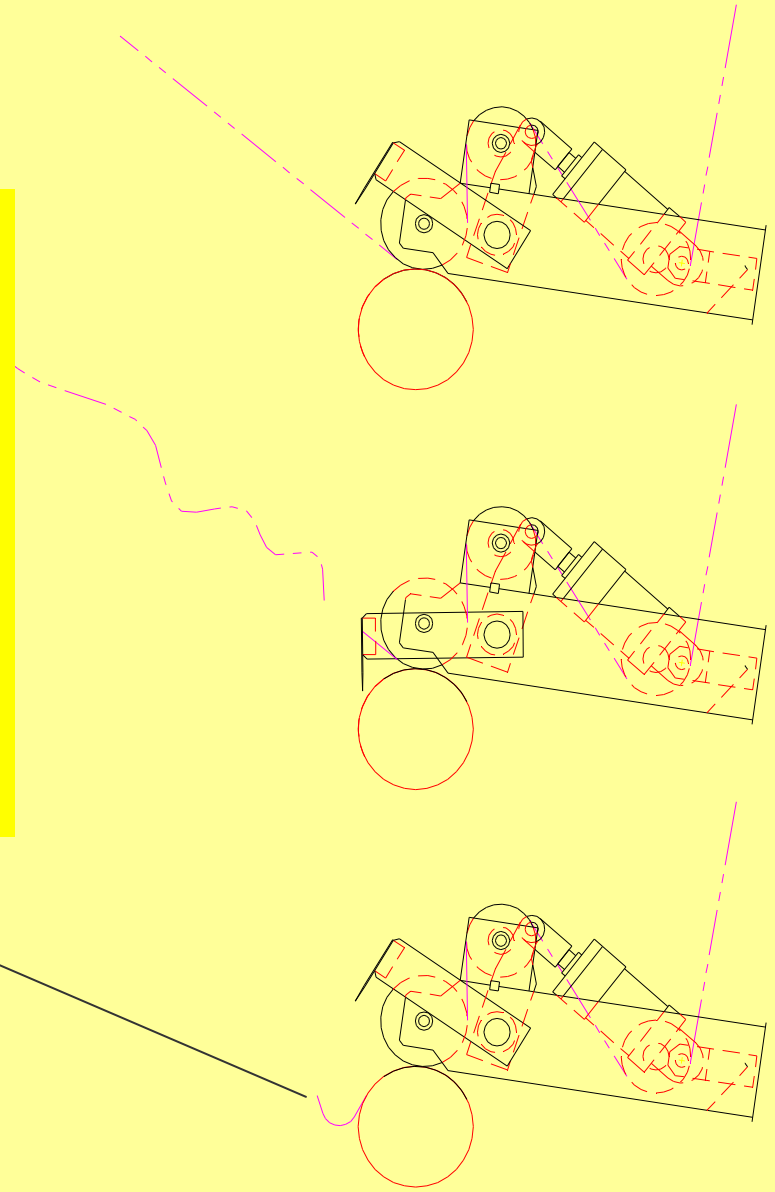
FOLD BACK AT ROLL CHANGE OR TRANSFER—CAUSES:

1. OLDER ROLL CHANGE OR CUTOVER TECHNIQUES:
   - BUMP AND CUT
   - PLUNGE KNIFE
   - CORE ENVELOPER

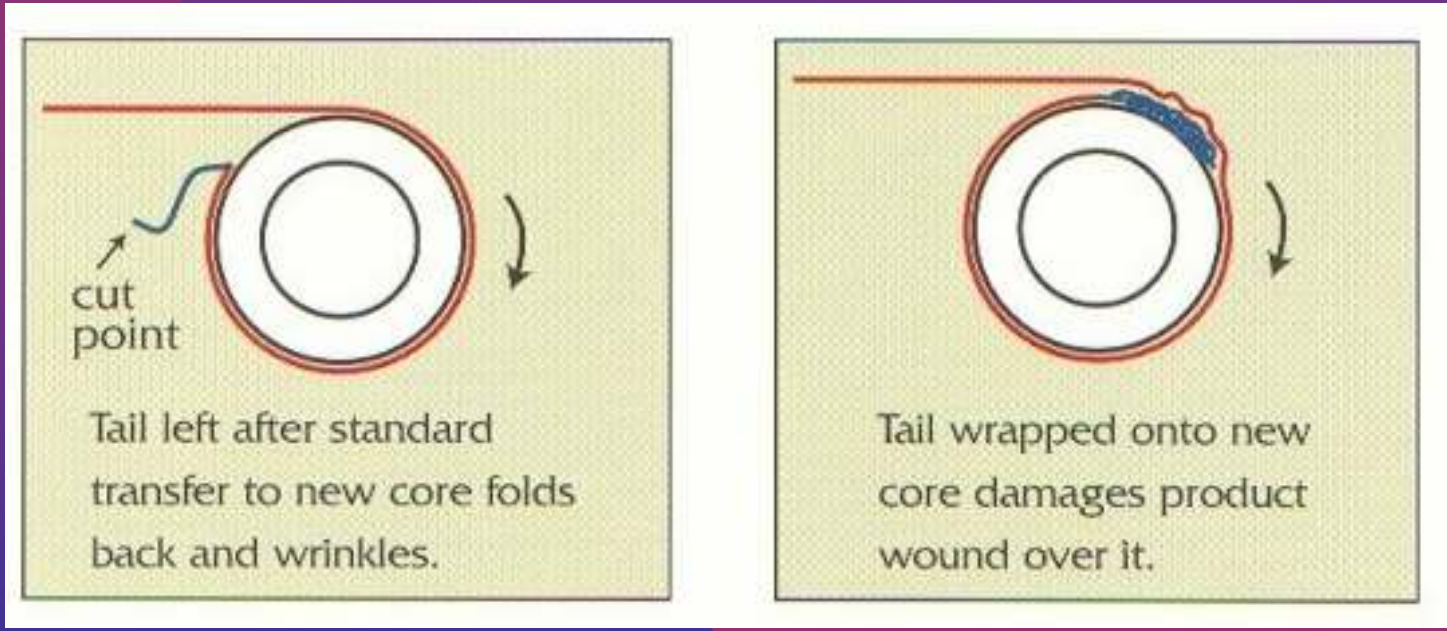
HISTORICALLY, THESE METHODS HAD FOLD BACK REMNANTS AS A SIDE-EFFECT.

AN EXAMPLE OF A PLUNGE KNIFE CAUSING FOLD BACK ON A TURRET WINDER ROLL CHANGE

FOLD BACK BEGINNING



FOLD BACK CAN CAUSE BAD STARTS ON A CORE, IN SOME CASES CREATING WASTED MATERIAL YARDS OUT FROM THE CORE



A LOT OF DEVELOPMENT EFFORT AND THE CREATION OF SOME NOTABLE PATENTS HAVE GONE INTO ELIMINATING OR MINIMIZING FOLD BACK

THE “STATIONARY KNIFE” DESIGN – PATENT NO. 4,422,586, by Tetro, WAS A MAJOR IMPROVEMENT OVER THE PREVIOUSLY CITED ROLL CHANGE METHODS.

United States Patent [19]

Tetro

[11] **4,422,586**

[45] **Dec. 27, 1983**

[54] **METHOD AND APPARATUS FOR ROLL CHANGING**

[75] Inventor: **Richard S. Tetro**, Fulton, N.Y.

[73] Assignee: **The Black Clawson Company**, Middletown, Ohio

[21] Appl. No.: **325,445**

[22] Filed: **Nov. 27, 1981**

[51] **Int. Cl.**³ **B65H 19/26**; B65H 19/28

[52] **U.S. Cl.** ..... **242/56 R**

[58] **Field of Search** ..... 242/56 R, 56 A, 64, 242/65, 66, 67.1 R

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,383,062	5/1968	Meihofer et al.	242/56 A
3,734,423	5/1973	Kataoka	242/56 A
3,871,595	3/1975	Smolderen	242/56 A
3,930,620	1/1976	Taitel	242/56 A
4,058,267	11/1977	Schüttler	242/56 A
4,326,679	4/1982	Phelps et al.	242/56 A
4,326,680	4/1982	Tetro et al.	242/56 A
4,370,193	1/1983	Knauthe	242/56 R

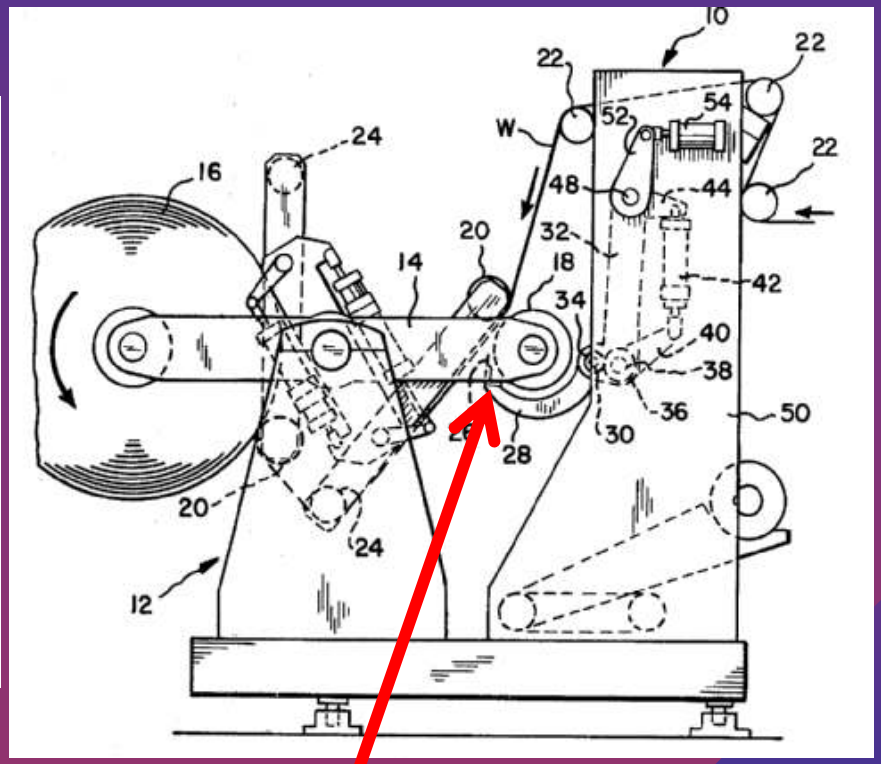
Primary Examiner—Stanley N. Gilreath

Attorney, Agent, or Firm—Biebel, French & Nauman

[57] **ABSTRACT**

A cutting blade is mounted on an articulated arm for movement into location adjacent a new core and a free running span of the web on a winding machine. An adhesive strip is applied to the new core and then the core is rotated. A pressure roller on an opposite side of the web from the new core then urges the web into engagement with the surface of the new rotating core. As the adhesive strip rotates into contact with the moving web, it causes the web to be deflected into the knife which results in severing of the web. The leading edge of the severed web is maintained adhered to the adhesive strip so that no fold back of the leading edge occurs as the web continues to wind on the new core.

12 Claims, 10 Drawing Figures



STATIONARY KNIFE ROLL CHANGE PATENT

- FOLD BACK AT ANY SPEED IS NEARLY ELIMINATED
- ORIGINAL DESIGN HAS BEEN IMPROVED UPON

•CUTTING BLADE

PATENT NO. 5,791,587, by Pasquale, PRESENTS ANOTHER METHOD OF CUTTING THE WEB AND TRANSFERRING THE LEADING EDGE TO A NEW CORE ON A TURRET WINDING APPARATUS.

United States Patent [19]

Pasquale

[11] **Patent Number:** **5,791,587**

[45] **Date of Patent:** **Aug. 11, 1998**

[54] **APPARATUS AND METHOD FOR TRANSFERRING A FEEDING WEB FROM A FILLED TAKEUP CORE TO AN EMPTY TAKEUP CORE**

[75] Inventor: **Robert A. Pasquale**, Hawthorne, N.J.

[73] Assignee: **New Era Converting Machinery, Inc.**, Patterson, N.J.

[21] Appl. No.: **824,145**

[22] Filed: **Mar. 25, 1997**

[51] **Int. Cl.**[6] **B65H 35/08**; B65H 35/04

[52] **U.S. Cl.** **242/527.1**; 242/527.6; 242/527.7

[58] **Field of Search** 242/527.1, 527.5, 242/527.6, 527.7, 527.2

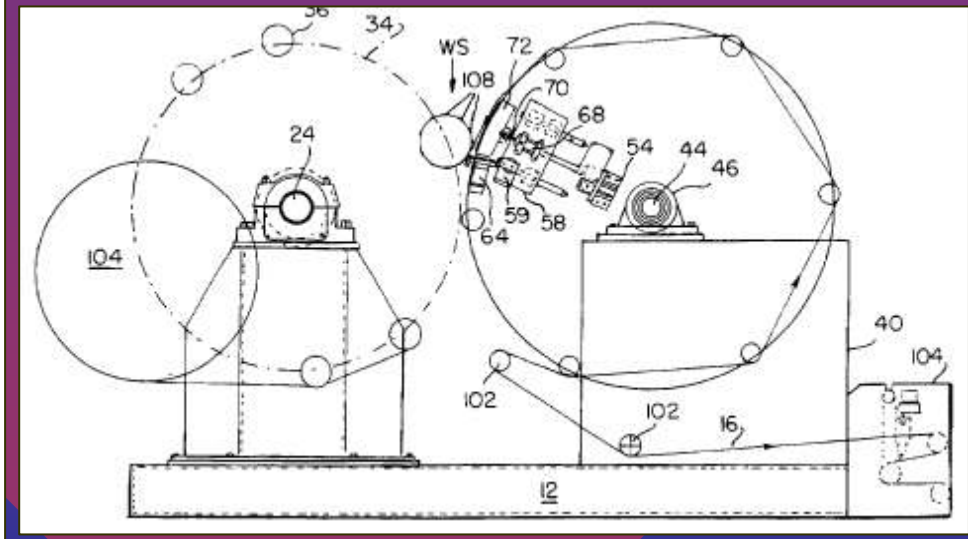
[56] **References Cited**

U.S. PATENT DOCUMENTS

4,404,880 9/1983 DeLuca ..... 242/527.1 X

[57] **ABSTRACT**

Apparatus for transferring a web moving in a guided and supported web feeding course traversing around a rotary frame and passing therefrom to and winding as a web stock on a first core at a winding station proximal a rotary frame periphery is provided with a rotary circular cutter on the rotary frame that cuts the moving web crosswise of the web travel. Prior to cutting the web the first core is moved away from the winding station and replaced thereat with an empty takeup core. The rotary frame is then rotationally speeded up so that its periphery at which a frame carried web contact shoe and rotary cutter can be positioned move in tandem with the web. The web contact shoe can then be brought into contact with the web to hold it and the circular cutter is operated to cut the feeding web. A trailing end of a part of the web downstream of the cut continues on to windup on the first core. A leading end of the part of the web upstream remains held by the contact shoe. The contact shoe following web cutting is stroked outwardly slightly of the rotary frame periphery so that as the contact shoe passes proximal a periphery of the empty core, the leading end of the web contacts the empty core periphery and starts to wind on the core periphery, this thereby accomplishing transfer of the feeding web to the core winding operation.



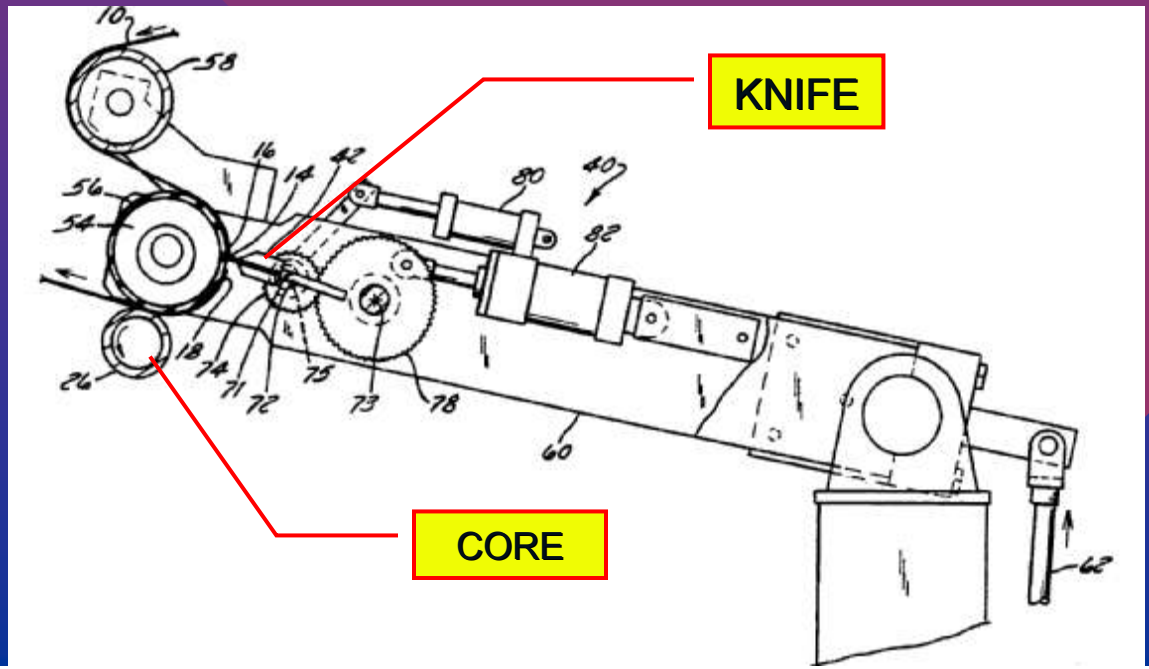
Cut the web prior to core contact using a traversing knife mounted on a rotary web transport device

ANOTHER PATENT OFFERED A DIFFERENT APPROACH TO ELIMINATING FOLD BACK

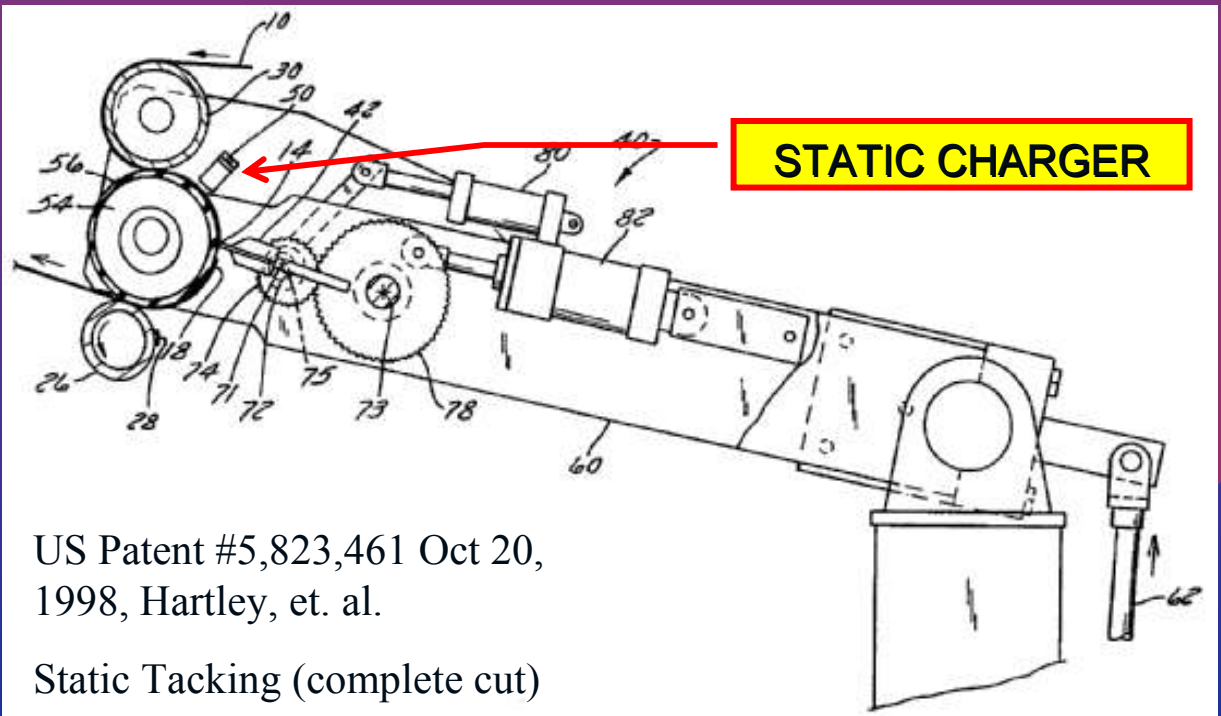
- CUT THE WEB PRIOR TO THE CORE CONTACT
- GAPPED KNIFE – "TAB-CUT" TRANSFERS THE WEB TO THE CORE

US Patent #5,368,253 Nov. 29, 1994, Hartley

Gapped Knife; Tab-Cut



A SUBSEQUENT DESIGN UTILIZED A STATIC CHARGE TO PIN THE WEB TO THE LAYON ROLL TO TRANSFER WITH A CLEAN STRAIGHT CD CUT



US Patent #5,823,461 Oct 20, 1998, Hartley, et. al.

Static Tacking (complete cut)

THESE DESIGNS ARE A SIGNIFICANT DEPARTURE FROM PRIOR TECHNOLOGY - IN SUMMARY

- OLD
  - THE WEB IS SEVERED AT A POINT BETWEEN THE CORE AND THE WINDING ROLL
  - THE CUT TAKES PLACE AFTER THE WEB HAS CONTACTED THE INCOMING CORE.
- NEW
  - WEB IS CUT BEFORE IT ARRIVES AT CORE

- NEW IN THE LATTER DESIGNS:

TWO METHODS ARE EMPLOYED TO CONTROL AND DIRECT THE LEADING YET SEVERED EDGE OF THE WEB TO THE DOWNSTREAM CORE.

1. THE FIRST IS TO LEAVE SMALL, UNCUT "TABS" IN THE WEB, WHICH SUBSEQUENTLY BREAK AS THE WEB ARRIVES AT THE PRE-TAPED CORE.
2. THE SECOND IS TO SEVER THE WEB COMPLETELY BUT TO TRANSPORT THE WEB FROM THE CUT POINT TO THE NEW CORE BY ATTACHING IT TO A RUBBER TRANSPORTING ROLL UTILIZING A MOMENTARY CHARGE OF STATIC ELECTRICITY.

MOST OF THE PREVIOUS DESIGNS DEPEND ON A **TURRET** TO MOVE THE NEW CORE INTO POSITION FOR THE TRANSFER:

- *TURRET ROTATION* CAUSES THE WINDING ROLL TO LEAVE THE HOME POSITION AND LOSE CONTACT WITH THE LAYON ROLL

- LOSS OF NIP occurs
  - WINDING WEB MAY EXPERIENCE CHANGES
    - ➢TENSION UPSET
    - ➢WEB MISALIGNMENT
    - ➢BOUNDARY LAYER AIR ENTERS BETWEEN WRAPS

  (ALL OF WHICH ARE BAD!!)

CUTTING THE WEB COMPLETELY PRIOR TO ITS ARRIVAL AT THE CORE AND TRANSPORTING THE CUT WEB TO THE CORE HAS ALLOWED SOME NEW CONCEPTS IN WINDING

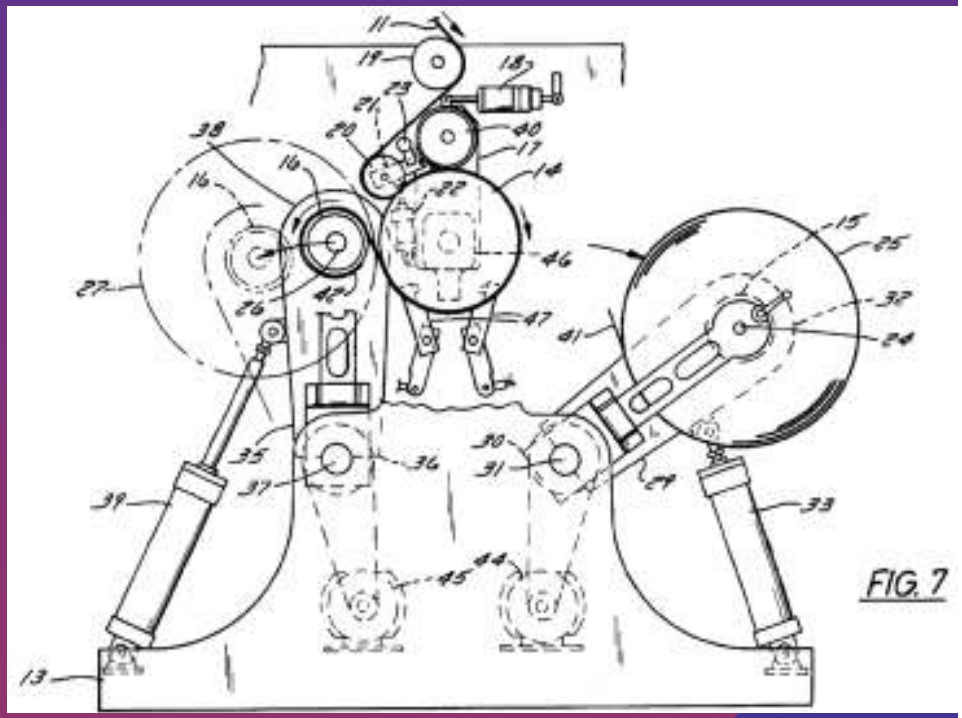
- ELIMINATE THE NEED FOR A TURRET
- ALLOW APPLICATION OF CONTINUOUS LAYON ROLL FOR CONSTANT NIP

LEADING TO PATENT No. 6,264,130

United States Patent *6,264,130* Hartley, Jr.
July 24, 2001 Duplex web roll winding and splicing apparatus

Abstract

An apparatus and method of winding a continuously moving web, and for splicing and transferring the web from a first core to a second core with no-fold-back or wrinkling of the web material during the splice. The web is fed through a first nip point and thereby applied to a lay-on roll, the lay-on roll further applying the web material onto first and second cores alternatively. An electrostatic charging bar positioned downstream from the nip point emits an electrostatic charge onto the web to temporarily adhere the web to the lay-on roll. A rotatable cutting knife cooperatively engageable with the lay-on roll cuts the web at a point downstream from the electrostatic charging bar but upstream from the first and second cores to produce a tail and new leading edge. The tail continues to be wound about the first roll, and the new leading edge is affixed to the second roll and the web is thereafter wound about the second core. The first and second cores are each independently movable toward and away from the lay-on roll so the web may be spliced and transferred from the first core to the second core, and alternatively from the second core to the first core.



(12) **United States Patent**
Hartley, Jr.

(10) **Patent No.: US 6,264,130 B1**
(45) **Date of Patent: Jul. 24, 2001**

(54) **DUPLEX WEB ROLL WINDING AN SPLICING APPARATUS**

(75) Inventor: **John J. Hartley, Jr.**, Pewauk (US)

(73) Assignee: **Faustel, Inc.**, Germantown, V

(*) Notice: Subject to any disclaimer, the patent is extended or adjuste U.S.C. 154(b) by 0 days.

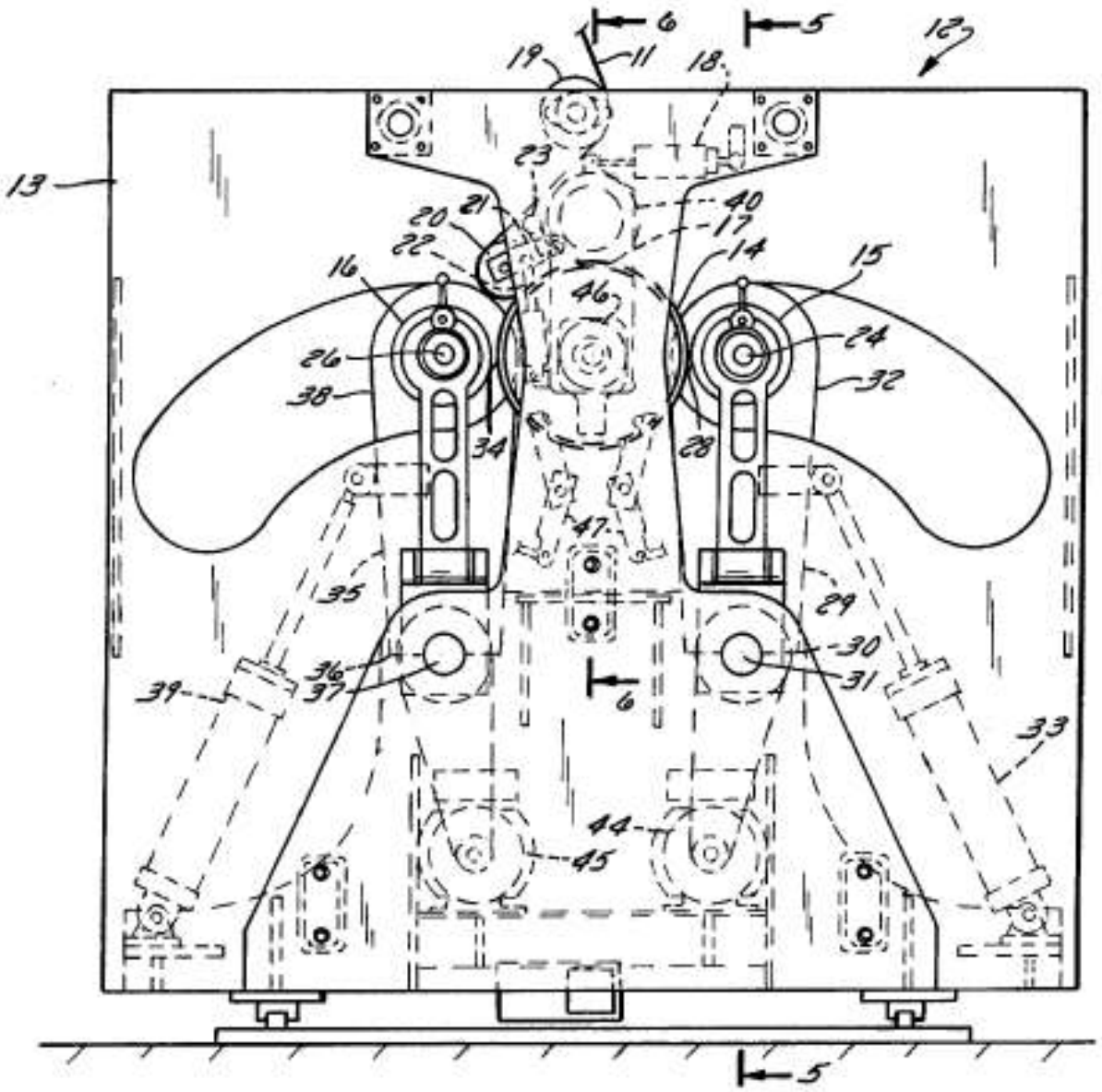
(21) Appl. No.: **09/394,164**

(22) Filed: **Sep. 13, 1999**

(51) **Int. Cl.**[7] I

(52) **U.S. Cl.** **242/527.3**; 242/531

(58) **Field of Search** 24 242/523, 527, 527.2, 527.4, 5 530.4, 541, 541.1, 541.7, 5



“SCRAPLESS” WINDING

- TACK THE WEB TO THE DRUM WITH STATIC
- CLEANLY SEVER THE WEB WITH ROTARY KNIFE
- LEADING EDGE TRAVELS ON SURFACE DRUM TO NEW CORE
- WEB IS PRESSED ONTO TAPE AT NEW CORE
- NEW ROLL WINDS CONTINUOUSLY WITH NIP
- SURFACE DRUM WINDS IN TENSION
- SPINDLE WINDS IN ADJUSTABLE TORQUE
- *WIND WITH TNT TO THE VERY END OF THE ROLL!!!*

A SCRAPLESS WINDING SYSTEM

NIP ROLL

STATIC CHARGING BAR

ROTARY KNIFE

SURFACE DRUM/LAYON ROLL

SPINDLES

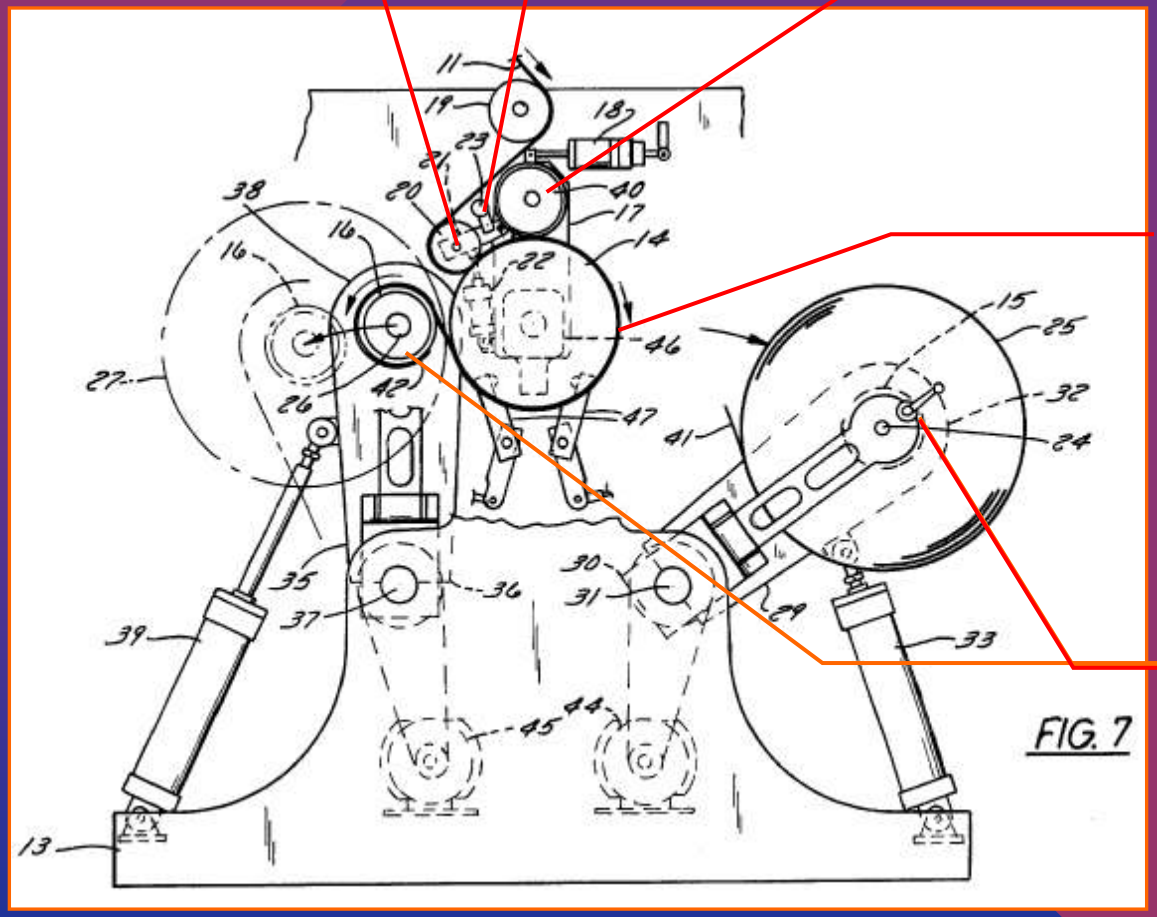


FIG. 7

SCRAPLESS WINDING

AN EXAMPLE OF A WINDER DESIGN WITH:

- CONTINUOUS LAYON NIP
- CENTER WINDING W/ SURFACE ASSIST

SCRAPLESS WINDING

PILOT WINDER

AN EXAMPLE OF A WINDER DESIGN WITH:

- CONTINUOUS LAYON NIP
- CENTER WINDING W/ SURFACE ASSIST

SCRAPLESS WINDING

KEYS TO DESIGN

- NO TURRET
- ROTARY KNIFE
  - SERVO DRIVE
- CONTINUOUS LAYON ROLL
  - SERVO DRIVE
- SURFACE AND CENTER WINDING

"SCRAPLESS" WINDING

New application of the time-tested TNT principle gives the processor:

- *ability to lay-down a wrinkle free core start*
- *ability to wind to the last wrap in contact with the lay-on roll*
- *success in winding films that have proved troublesome or impossible for conventional turret winders*
- *superior roll quality and structure providing a desirable hard start and transitioning to a desirable finish.*
- *rolls that do not telescope or dish, do not suffer from starring and have no waste.*
- *in-line slitting to the extent not previously thought possible on a continuous type winder.*

SCRAPLESS WINDING-

A REALITY!!

Thank you very much

CLICK TO RETURN
TO LIST OF
PAPERS AND
PRESENTATIONS