

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO	
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DEP: 2020 DIRECCION DE NUEVAS CREACIONES	EVE: 378 FASE NACIONAL INCLUIDO CAPITULO I
TRA: 11 PCT-PATENTE DE INVENCION CAPITULOS I Y II	FOLIOS: 11
ACT: 519 PRESENTACION	

DIRECCIÓN DE NUEVAS CREACIONES

2020
Bogotá, D.C.,

Abogado(a)/Señor(a)
LUIS FELIPE CASTILLO GIBSON

Asunto: Radicación: 12-163795- -4
Trámite: 11
Evento: 378
Actuación: 519
Oficio: 2473
Folios: 11

Patente de Invención	X			Patente de Modelo de Utilidad	
Vía Nacional					
Vía PCT (Fase Nacional)	X	Capítulo I	X	Capítulo II	
No. Solicitud Internacional	PCT/US2011/029292				
Fecha de Presentación Internacional	22/03/2011				

Como resultado del examen de fondo realizado, con fundamento en el Artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se comunica:

1. Documentos estudiados

Descripción:	Rad. N° 12-163795-00000-0000	21/septiembre/2012
Reivindicaciones:	Rad. N° 12-163795-00000-0000	21/septiembre/2012
Dibujos:	Rad. N° 12-163795-00000-0000	21/septiembre/2012
Prioridad:	US 12/659,887	24/Marzo/2010

2. Objeto de la invención

De acuerdo con lo establecido en el numeral 1.2.2.2 del Capítulo Primero del Título X de la Circular Única para efectos del examen de patentabilidad, se tendrá en cuenta la tasa pagada por el solicitante al momento de comenzar el examen para las reivindicaciones adicionales; esto es que cuando la solicitud contenga más de diez (10) reivindicaciones y no se haya pagado la tasa complementaria, sólo se estudiarán las cubiertas por la tasa pagada. Por lo tanto, se estudiaran las reivindicaciones 1 a 9.

Título de la solicitud: “Sistema de desenrollado de metal en láminas verticales” (Fl. 1).

El problema planteado en esta solicitud consiste en la necesidad de aprovisionar láminas

de metal para la construcción de edificios.

Para resolver este problema técnico, la solicitud en estudio proporciona propone un sistema de desenrollado de láminas, que comprende una estructura soporte, un eje rotativo en orientación vertical y múltiples rodillos de soporte cónicos.

El objeto de la presente solicitud se relaciona con la Clasificación Internacional de Patentes (CIP): B65H16/00.

3. De la solicitud de patente

Reivindicaciones (Art 30 D 486, Art 22 PCT)

El capítulo reivindicatorio no es claro porque:

- 1- La reivindicación 8 y las expresiones: *“el eje susceptible de rotarse configurado (...) en láminas”*, *“los múltiples rodillos de soporte cónicos configurados (...) en láminas”* (reivindicación 1); *“para contactar una superficie interna del núcleo hueco (...) del eje susceptible de rotarse”* (reivindicación 3); *“para guiar una porción del material en láminas (...) bobina”* (reivindicación 4); *“para accionar una rotación (...) rodillos de soporte”* (reivindicación 5); *“el montaje de marco (...) estructura soporte”* (reivindicación 6); *“una posición del rodillo de retención es susceptible de ajustarse en orientación radial”*, *“configurado para presionar contra una superficie externa de la bobina del material en láminas”* (reivindicación 7); *“que rota con el eje susceptible de rotarse”*, *“configurado para presionarse contra el disco para proveer una fuerza de fricción”* (reivindicación 9); describen funciones, efectos, usos, ventajas o resultados a alcanzar, los cuales no son características susceptibles de patente. Cabe aclarar, que el producto reclamado se debe definir técnicamente mediante sus características estructurales. Se sugiere al solicitante eliminar la reivindicación y expresiones citadas.
- 2- La reivindicación 8 incluye el mecanismo de tensión, el cual también está reclamado en la reivindicación 9. Teniendo en cuenta que en la reivindicación 9 están descritas las características estructurales de dicho mecanismo, se sugiere al solicitante eliminar la reivindicación 8, ya que ésta no menciona ninguna característica estructural adicional que distinga el mecanismo de tensión. De acuerdo con lo expuesto, se considera que la reivindicación 8 carece de concisión.
- 3- El capítulo reivindicatorio presenta términos de carácter general, que sugieren de forma imprecisa que la protección se extiende a otras posibles variaciones o modificaciones, lo que no permite compararlo con el estado de la técnica. En específico, dichos términos son: *“mecanismo ajustable que comprende varios elementos”* (reivindicación 3), *“un mecanismo de accionamiento”* (reivindicación 5), *“montaje de marco susceptible de ajustarse”* (reivindicación 6). Lo anterior, debido a que no se expone como están conformados, ni donde están dispuestos estos elementos dentro del producto reclamado. Como se mencionó anteriormente, estas reivindicaciones describen sus características mediante funciones, efectos o resultados a alcanzar. De acuerdo con lo expuesto, se sugiere al solicitante describir el producto para el cual se solicita protección mediante sus características técnicas.
- 4- Las reivindicaciones 4 y 7 incluyen la expresión *“a lo largo”*, la cual no es clara, toda vez que el eje del rodillo de retención y el eje de los rodillos guía no están dispuestos *“a lo largo”* del eje de rotación del eje susceptible de rotarse. Dichos ejes están dispuestos *“de forma paralela”* al eje de rotación del eje susceptible de rotarse. De acuerdo con lo anterior, se sugiere al solicitante reemplazar el término *“a lo largo”* por *“de forma paralela”*.
- 5- Con el fin de facilitar la identificación de las características técnicas reclamadas, en los dibujos y en el resto de la solicitud, se sugiere al solicitante incluir los números de referencia de todas las características incluidas en las reivindicaciones. Se recomienda

verificar que los números de referencia que se incluyan, concuerden con los presentados en la descripción y en los dibujos de la solicitud.

4. Determinación del Estado de la Técnica

El estado de la técnica se determinó con base en la fecha de presentación de la solicitud de prioridad: marzo 24 de 2010, y se encontraron los siguientes documentos que anticipan el objeto de esta solicitud:

Ítem	Documento	Título	Fecha de Publicación
D1	US 3'512.728	'Uncoiler'	19/Mayo/1970
D2	US 3'216.671	'Apparatus for loosening tightly wound reels of strip'	28/Junio/1962
D3	US 2007/0170301	'Sheet metal decoiling device and multi-coil decoiling system'	26/Julio/2007
D4	US 2007/0210202	'Apparatus for lifting and supporting fence rolls'	13/Septiembre/2007
D5	WO 96/37427	'Independently tensioned dual unwind and take-up mechanism using a common shaft mounting'	28/Noviembre/1996

El documento D1¹ divulga un aparato para desenrollado de grandes bobinas de acero, que comprende un centro rotatorio que recibe la apertura central de una bobina de acero. También consta de una serie de rodillos cónicos, que se disponen radialmente del centro de aparato, en los cuales la bobina de acero es superpuesta (Col. 1, líneas 12 a 16).

El documento D2² divulga un aparato para desenrollar un carrete, que comprende una superficie para recibir el carrete, la cual se compone por rodillos cónicos, dispuestos en forma de estrella, alrededor de un centro. (Col. 2, líneas 39 a 44).

El documento D3³ divulga un aparato para desenrollar un una bobina de lámina de metal (1), montado en el soporte de una maquina de construcción (2). Una bobina de lámina de metal es montada en el aparato (1) de tal manera que la lámina de metal pueda ser alimentada a dicha máquina de construcción (2) (Párr. [0040]).

El documento D4⁴ divulga un aparato para desenrollar un una bobina de cerca de alambre, dicho aparato está ensamblado de tal manera que pueda ser desplazado entre una primera posición, donde el poste está orientado de forma vertical, y una segunda posición, donde el poste esta de forma horizontal (resumen).

El documento D5⁵ divulga un mecanismo para dispensar tela, dispuesta en rollos o bobinas, a un proceso de manufactura, que comprende unos medios para el control de la rotación, preferiblemente, frenos. (Pág. 1, líneas 5 a 7; Pág. 4, líneas 3 a 6).

5. Examen de Patentabilidad (Art 14 D486)

Novedad (Art 16 D486)

La reivindicación 1 consiste en: “*Un dispositivo para desenrollar una bobina del material en láminas, caracterizado porque comprende: una estructura soporte; un eje susceptible de rotarse...*” (Ver página 16 del radicado N° 12-163795-00000-0000).

Comparación de las características técnicas esenciales, con las del estado de la técnica:

1 <https://www.google.com/patents/US3512728?pg=PA1&dq=3512728&hl=es&sa=X&ei=MefzUtvRJ5K2kQe97IBQ&ved=0CEEQ6AEwAQ>

2 <https://www.google.com/patents/US3216671?pg=PA1&dq=3216671&hl=es&sa=X&ei=EufzUsvaLZHskQfAnoGYAg&ved=0CDgQ6AEwAA>

3 <https://www.google.com/patents/US20070170301?pg=PA1&dq=20070170301&hl=en&sa=X&ei=PDrlUoKII6PK0wGJ3YGIg&ved=0CDMQ6AEwAA>

4 <https://www.google.com/patents/US20070210202?pg=PA4&dq=20070210202&hl=en&sa=X&ei=tDL1UtnCN4OW0QHv1YHABQ&ved=0CDUQ6AEwAA>

5 http://worldwide.espacenet.com/publicationDetails/biblio?CC=WO&NR=9637427&KC=&FT=E&locale=en_EP

Características esenciales	D1	D2
Dispositivo para desenrollar una bobina de material de lámina, caracterizado por:	Aparato para desenrollado de bobinas de acero caracterizado por:	Aparato para desenrollado de un carrete caracterizado por:
Una estructura de soporte.	Una estructura de soporte (3) (Fig. 2; Col. 2, líneas 32 a 33).	Un plato base (23) (Fig. 1; Col. 3, líneas 1 y 2).
Un eje susceptible de rotarse soportado por la estructura soporte, el eje susceptible de rotarse tiene un eje de rotación que se orienta en una orientación sustancialmente vertical.	Una estructura de eje rotatoria (13), ubicada en el centro de la estructura de soporte (3), compuesta por un tambor centrador (15) el cual está asegurado a un eje vertical (17). La estructura de eje rotatoria tiene un eje de rotación que se orienta en una orientación sustancialmente vertical (Figs. 1 y 2; Col. 2, líneas 36 a 39).	Una carcasa rotatoria (34), soportado por la estructura soporte, la carcasa rotatoria (34) tiene un eje de rotación que se orienta en una orientación sustancialmente vertical (Fig. 1; Col. 3, líneas 18 a 25).
Múltiples rodillos de soporte cónicos soportados por la estructura de soporte, cada rodillo de soporte cónico tiene una forma cónica con un extremo ancho y un extremo estrecho, cada rodillo de soporte cónico tiene un eje de rotación, cada rodillo de soporte cónico está dispuesto de manera tal que su respectivo eje de rotación está orientado hacia el eje de rotación del eje susceptible de rotarse, cada rodillo de soporte cónico está dispuesto de manera tal que su extremo estrecho está ubicado hacia el eje susceptible de rotarse.	Extendiéndose de forma radial del tambor central (15) se disponen 8 estructuras de rodillos soporte, soportadas por la estructura de soporte (3). Cada una de estas estructuras incluye un rodillo cónico (23). Cada rodillo cónico (23) comprende con un extremo ancho y un extremo estrecho, cada rodillo cónico (23) tiene un eje de rotación (25), cada rodillo cónico (23) está dispuesto de manera tal que su respectivo eje de rotación está orientado hacia el eje de rotación (17) de la estructura de eje rotatoria (13), cada rodillo cónico (23) está dispuesto de manera tal que su extremo estrecho está ubicado hacia el eje (17) de la estructura de eje rotatoria (13) (Figs. 3; Col. 2, líneas 43 a 62).	Múltiples rodillos cónicos (22), dispuestos en forma de estrella, soportados por un plato base (23). Cada rodillo cónico (22) tiene un extremo ancho y un extremo estrecho, cada rodillo cónico (22) tiene un eje de rotación, cada rodillo cónico (22) está dispuesto de manera tal que su respectivo eje de rotación está orientado hacia el eje de rotación de la carcasa rotatoria (34), cada rodillo cónico (22) está dispuesto de manera tal que su extremo estrecho está ubicado hacia el eje central (32) (Col. 2, líneas 69 a 71; Col. 3, líneas 1 a 40).

De acuerdo con la tabla anterior, las características esenciales del dispositivo para desenrollar bobinas de la reivindicación 1 habrían sido divulgadas previamente en los documentos D1 y D2, por lo tanto, la materia reivindicada no es nueva.

Asimismo, los documentos D1 y D2 divulgan las características de las reivindicaciones dependientes así:

- Reivindicación 2: los ejes de rotación de los rodillos cónicos (23) y (22) de los documentos D1 y D2 respectivamente, se orientan en un ángulo θ con relación a una orientación horizontal que es perpendicular al eje de rotación del eje susceptible de rotarse (D1: Fig. 3; D2: Fig. 1). En las siguientes figuras, se muestra dicho ángulo θ , divulgado en los documentos antecedentes.

Figura 3 del documento D1

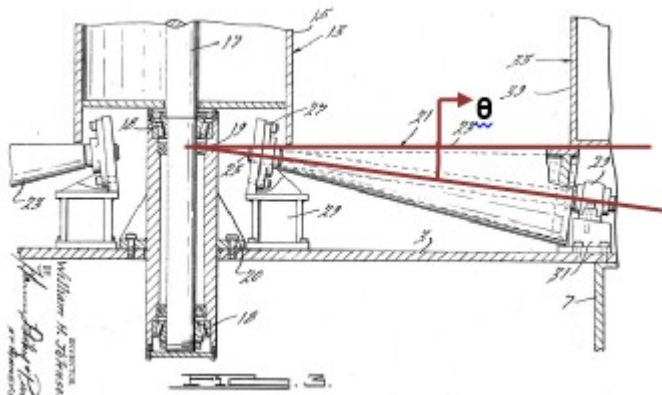
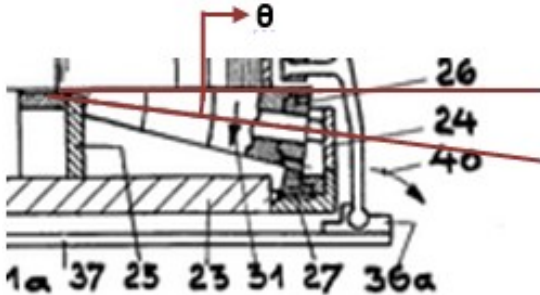


Figura 1 del documento D2



- Reivindicación 4: El documento D1 divulga los rodillos guía (59) y (77), que están soportados por la estructura soporte (3) (Fig. 1; Col. 3, líneas 4 a 26).
- Reivindicación 5: El documento D2 divulga engranajes (26) montados en cada uno de los ejes de los rodillos cónicos (22), los cuales engranan en la corona dentada (27) montada en el plato base (23), conectada al piñón (28) del motor (29), el cual rota en la dirección de la flecha (30), de tal manera que son accionados uniformemente (Figs. 1 y 2; Col. 3, líneas 10 a 16).
- Reivindicación 7: El documento D2 enseña los rodillos (35) soportados por el plato base, que se pueden mover en la dirección (40) (Fig. 1; Col. 3, líneas 25 a 29).

En consecuencia, las reivindicaciones 1, 2, 4, 5 y 7 no tienen características novedosas.

Nivel inventivo (Art18 D486)

En lo que tiene relación con la reivindicación 3, se tiene lo siguiente:

Comparación de las características técnicas esenciales, con las del estado de la técnica:

Reivindicaciones	Características esenciales	D1	D3
Reivindicación 1	Dispositivo para desenrollar una bobina de material de lámina, caracterizado por:	Aparato para desenrollado de bobinas de acero caracterizado por:	Aparato para desenrollar una bobina de lámina de metal caracterizado por:
	Una estructura de soporte.	Una estructura de soporte (3) (Fig. 2; Col. 2, líneas 32 a 33).	Una estructura soporte (61) (Fig. 3A; Párr. [0044])
	Un eje susceptible de rotarse soportado por la estructura soporte, el eje susceptible de rotarse tiene un eje de rotación que se orienta en una orientación	Una estructura de eje rotatoria (13), ubicada en el centro de la estructura de soporte (3), compuesta por un tambor centrador (15) el cual	Un mandril rotatorio (20) soportado por las aperturas (61A) de la estructura soporte 61 (Figs. 3A; Párr. [0047]).

	sustancialmente vertical.	está asegurado a un eje vertical (17). (Figs. 1 y 2; Col. 2, líneas 36 a 39).	
	El eje susceptible de rotarse tiene un eje de rotación que se orienta en una orientación sustancialmente vertical.	La estructura de eje rotatoria tiene un eje de rotación que se orienta en una orientación sustancialmente vertical (Fig. 1).	No menciona.
	Múltiples rodillos de soporte cónicos soportados por la estructura de soporte, cada rodillo de soporte cónico tiene una forma cónica con un extremo ancho y un extremo estrecho, cada rodillo de soporte cónico tiene un eje de rotación, cada rodillo de soporte cónico está dispuesto de manera tal que su respectivo eje de rotación está orientado hacia el eje de rotación del eje susceptible de rotarse, cada rodillo de soporte cónico está dispuesto de manera tal que su extremo estrecho está ubicado hacia el eje susceptible de rotarse.	Extendiéndose de forma radial del tambor central (15) se disponen 8 estructuras de rodillos soporte, soportadas por la estructura de soporte (3). Cada una de estas estructuras incluye un rodillo cónico (23). Cada rodillo cónico (23) comprende con un extremo ancho y un extremo estrecho, cada rodillo cónico (23) tiene un eje de rotación (25), cada rodillo cónico (23) está dispuesto de manera tal que su respectivo eje de rotación está orientado hacia el eje de rotación (17) de la estructura de eje rotatoria (13), cada rodillo cónico (23) está dispuesto de manera tal que su extremo estrecho está ubicado hacia el eje (17) de la estructura de eje rotatoria (13) (Figs. 3; Col. 2, líneas 43 a 62).	No menciona.
Reivindicación 3	El eje susceptible de rotarse comprende un mecanismo ajustable que comprende varios elementos.	No menciona.	El mandril (20) comprende múltiples porciones (expandibles/Contraíbles) como mecanismos tipo tijera controlados por la manivela (24) (Fig. 3A; Párr. [0047]).

Los documentos D1 y D3 se consideran el estado de la técnica cercano a la invención definida en las reivindicaciones 1 y 3, porque divulgan aparatos para el desenrollado de bobinas de lámina de acero (D1: Col. 1, líneas 12 a 16, D3: Párr. [0040]).

La diferencia entre la invención, definida en las reivindicaciones 1 y 3, y el aparato para el desenrollado de bobinas de D1, consiste en un mecanismo ajustable que comprende varios elementos para contactar una superficie interna del núcleo de la bobina.

La diferencia entre la invención, definida en las reivindicaciones 1 y 3, y el aparato para el desenrollado de bobinas de D3, consiste en que el eje susceptible de rotarse tiene una orientación sustancialmente vertical y comprende los múltiples rodillos de soporte cónicos.

El efecto que logra el incluir el mecanismo ajustable que comprende varios elementos para contactar una superficie interna del núcleo de la bobina, es que permite ajustarse a varios tamaños de núcleo de la misma, así como también, facilita el desacople de dicho núcleo al terminar el proceso de desenrollado.

Por lo tanto, el problema técnico objetivo que pretende resolver esta invención se puede formular así: “cómo modificar el aparato para el desenrollado de bobinas conocido en D1, para permitir su ajuste a varios tamaños de núcleo de la bobina, así como también facilitar el desacople de dicho núcleo al terminar el proceso de desenrollado”.

Sin embargo, el mecanismo ajustable que comprende varios elementos para contactar una superficie interna del núcleo de la bobina, para permitir su ajuste a varios tamaños de núcleo de la bobina, así como también facilitar el desacople de dicho núcleo al terminar el proceso de desenrollado, ya está divulgado en el documento D3 que enseña un mandril (20) que comprende múltiples porciones (expandibles/contraíbles) como mecanismos tipo tijera controlados por la manivela (24) (Fig. 3A; Párr. [0047]).

En consecuencia, la persona del oficio normalmente versada en la materia, incluiría un mandril (20) que comprende múltiples porciones (expandibles/contraíbles) como mecanismos tipo tijera controlados por la manivela (24) del documento D3, en el aparato para el desenrollado de bobinas divulgado en el documento D1, para llegar así al objeto de las reivindicaciones 1 y 3 de la solicitud. Por lo cual, la reivindicación 3 se considera obvia.

En referencia a la reivindicación 6, se tiene que:

Reivindicaciones	Características esenciales	D1	D4
Reivindicación 1	Dispositivo para desenrollar una bobina de material de lámina, caracterizado por:	Aparato para desenrollado de bobinas de acero caracterizado por:	Un aparato para desenrollar una bobina de cerca de alambre caracterizado por:
	Una estructura de soporte.	Una estructura de soporte (3) (Fig. 2; Col. 2, líneas 32 a 33).	Una estructura de soporte compuesta por las bridas (40) y platos (41), un travesaño (70), una barra de sujeción (43), una brida (71) y un segundo plato (75). También incluye la plataforma (18) (Párrs. [0018] y [0019]).
	Un eje susceptible de rotarse soportado por la estructura soporte, el eje susceptible de rotarse tiene un eje de rotación que se orienta en una orientación sustancialmente vertical.	Una estructura de eje rotatoria (13), ubicada en el centro de la estructura de soporte (3), compuesta por un tambor centrador (15) el cual está asegurado a un eje vertical (17). (Figs. 1 y 2; Col. 2, líneas 36 a 39).	Poste (20) que es una pieza elongada cilíndrica. Los bujes (24) y (26) y sus bujes asociados permiten que el poste (20) rote en su base (20) (Párr. [0020]).
	El eje susceptible de rotarse tiene un eje de rotación que se orienta en una orientación sustancialmente vertical.	La estructura de eje rotatoria tiene un eje de rotación que se orienta en una orientación sustancialmente vertical (Fig. 1).	El poste (20) tiene una orientación sustancialmente vertical (Fig. 1).
	Múltiples rodillos de soporte cónicos soportados por la estructura de soporte, cada rodillo de soporte cónico tiene una forma cónica con un extremo ancho y un extremo estrecho, cada rodillo de soporte cónico tiene un eje de rotación, cada rodillo de soporte cónico está dispuesto de manera tal que su respectivo eje de rotación está orientado hacia el eje	Extendiéndose de forma radial del tambor central (15) se disponen 8 estructuras de rodillos soporte, soportadas por la estructura de soporte (3). Cada una de estas estructuras incluye un rodillo cónico (23). Cada rodillo cónico (23) comprende con un extremo ancho y un extremo estrecho, cada rodillo cónico (23) tiene	No menciona.

	de rotación del eje susceptible de rotarse, cada rodillo de soporte cónico está dispuesto de manera tal que su extremo estrecho está ubicado hacia el eje susceptible de rotarse.	un eje de rotación (25), cada rodillo cónico (23) está dispuesto de manera tal que su respectivo eje de rotación está orientado hacia el eje de rotación (17) de la estructura de eje rotatoria (13), cada rodillo cónico (23) está dispuesto de manera tal que su extremo estrecho está ubicado hacia el eje (17) de la estructura de eje rotatoria (13) (Figs. 3; Col. 2, líneas 43 a 62).	
Reivindicación 6	Montaje de marco susceptible de ajustarse.	No menciona.	Un montaje que comprende un brazo actuador (44) que esta ensamblado al segundo plato (75) de forma pivotante. Unn segundo extremo del brazo actuador (44) está conectado de forma pivotante a la pieza cilíndrica (16) por el pin (46). El brazo actuador incluye un cilindro hidráulico y un vástago (64). Debido al montaje anterior, el aparato puede moverse en las direcciones (A) y (D) (Párrs. [0018] y [0021]).

Los documentos D1 y D4 se consideran el estado de la técnica cercano a la invención definida en las reivindicaciones 1 y 6, porque divulgan aparatos para el desenrollado de bobinas de lámina de acero y de cerca de alambre (D1: Col. 1, líneas 12 a 16; D4: resumen).

La diferencia entre la invención, definida en las reivindicaciones 1 y 6, y el aparato para el desenrollado de bobinas de D1, consiste en un montaje de marco susceptible de ajustarse.

La diferencia entre la invención, definida en las reivindicaciones 1 y 6, y el aparato para el desenrollado de bobinas de D4, consiste en los múltiples rodillos de soporte cónicos.

El efecto que logra el incluir el montaje de marco susceptible de ajustarse, es que permite cambiar la orientación del dispositivo para desenrollar bobinas a una posición horizontal, con el fin de facilitar su transporte cuando esté en desuso.

Por lo tanto, el problema técnico objetivo que pretende resolver esta invención se puede formular así: “cómo modificar el aparato para el desenrollado de bobinas conocido en D1, para permitir cambiar la orientación del mismo a una posición horizontal, con el fin de facilitar su transporte cuando esté en desuso”.

Sin embargo, el montaje de marco susceptible de ajustarse para permitir cambiar la orientación del dispositivo para desenrollar bobinas a una posición horizontal, con el fin de facilitar su transporte cuando esté en desuso, ya está divulgado en el documento D4 que enseña un montaje que comprende un brazo actuador (44), que está ensamblado al segundo plato (75) de forma pivotante. Un segundo extremo del brazo actuador (44) está conectado de forma pivotante a la pieza cilíndrica (16) por el pin (46). El brazo actuador incluye un cilindro hidráulico y un vástago (64). Debido al montaje anterior, el aparato

puede moverse en las direcciones (A) y (D) (Párrs. [0018] y [0021]).

En consecuencia, la persona del oficio normalmente versada en la materia, incluiría el montaje que comprende un brazo actuador (44), que está ensamblado al segundo plato (75) de forma pivotante. Un segundo extremo del brazo actuador (44) que está conectado de forma pivotante a la pieza cilíndrica (16) por el pin (46). El brazo actuador que incluye un cilindro hidráulico y un vástago (64), enseñados en el documento D4, en el aparato para el desenrollado de bobinas divulgado en el documento D1, para llegar así al objeto de las reivindicaciones 1 y 4 de la solicitud. Por lo cual, la reivindicación 4 se considera obvia.

Por su parte, en cuanto a la reivindicación 9, se tiene que:

Reivindicaciones	Características esenciales	D1	D5
Reivindicación 1	Dispositivo para desenrollar una bobina de material de lámina, caracterizado por:	Aparato para desenrollado de bobinas de acero caracterizado por:	Mecanismo para dispensar tela de bobinas caracterizado por:
	Una estructura de soporte.	Una estructura de soporte (3) (Fig. 2; Col. 2, líneas 32 a 33).	Una estructura soporte (126) y (130) (Fig. 8; Col. 10, líneas 4 a 7).
	Un eje susceptible de rotarse soportado por la estructura soporte.	Una estructura de eje rotatoria (13), ubicada en el centro de la estructura de soporte (3), compuesta por un tambor centrador (15) el cual está asegurado a un eje vertical (17). (Figs. 1 y 2; Col. 2, líneas 36 a 39).	Un eje (20) que rota gracias a los engranajes (16) y (18) (Pág. 6, líneas 15 a 17).
	El eje susceptible de rotarse tiene un eje de rotación que se orienta en una orientación sustancialmente vertical.	La estructura de eje rotatoria tiene un eje de rotación que se orienta en una orientación sustancialmente vertical (Fig. 1).	No menciona.
	Múltiples rodillos de soporte cónicos soportados por la estructura de soporte, cada rodillo de soporte cónico tiene una forma cónica con un extremo ancho y un extremo estrecho, cada rodillo de soporte cónico tiene un eje de rotación, cada rodillo de soporte cónico está dispuesto de manera tal que su respectivo eje de rotación está orientado hacia el eje de rotación del eje susceptible de rotarse, cada rodillo de soporte cónico está dispuesto de manera tal que su extremo estrecho está ubicado hacia el eje susceptible de rotarse.	Extendiéndose de forma radial del tambor central (15) se disponen 8 estructuras de rodillos soporte, soportadas por la estructura de soporte (3). Cada una de estas estructuras incluye un rodillo cónico (23). Cada rodillo cónico (23) comprende con un extremo ancho y un extremo estrecho, cada rodillo cónico (23) tiene un eje de rotación (25), cada rodillo cónico (23) está dispuesto de manera tal que su respectivo eje de rotación está orientado hacia el eje de rotación (17) de la estructura de eje rotatoria (13), cada rodillo cónico (23) está dispuesto de manera tal que su extremo estrecho está ubicado hacia el eje (17) de la estructura de eje rotatoria (13) (Figs. 3; Col. 2, líneas 43 a 62).	No menciona.
Reivindicación 9	Un mecanismo de tensión que comprende un disco y un pedal.	No menciona.	Un freno compuesto por un disco (26) y un actuador (28),

			adaptados para interactuar entre sí. (Pág. 6, líneas 21 a 24).
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Los documentos D1 y D5 se consideran el estado de la técnica cercano a la invención definida en las reivindicaciones 1 y 9, porque divulgan aparatos para el desenrollado de bobinas de lámina de acero y tela (D1: Col. 1, líneas 12 a 16, D4: Pág. 1, líneas 5 a 7; Pág. 4, líneas 3 a 6).

La diferencia entre la invención, definida en las reivindicaciones 1 y 9, y el aparato para el desenrollado de bobinas de D1, consiste en un mecanismo de tensión que comprende un disco y un pedal.

La diferencia entre la invención, definida en las reivindicaciones 1 y 9, y el aparato para el desenrollado de bobinas de D5, consiste en los múltiples rodillos de soporte cónicos y el eje en orientación sustancialmente vertical.

El efecto que logra el incluir el mecanismo de tensión que comprende un disco y un pedal, es proporcionar tensión en el material de las bobinas para facilitar el proceso de desenrollado.

Por lo tanto, el problema técnico objetivo que pretende resolver esta invención se puede formular así: “cómo modificar el aparato para el desenrollado de bobinas conocido en D1, para proporcionar tensión en el material de las bobinas para facilitar el proceso de desenrollado”.

Sin embargo, mecanismo de tensión que comprende un disco y un pedal para desenrollar bobinas a una posición horizontal, con para proporcionar tensión en el material de las bobinas para facilitar el proceso de desenrollado, ya está divulgado en el documento D5 que enseña un freno compuesto por un disco (26) y un actuador (28), adaptados para interactuar entre sí, para mantener la tensión de la tela (64) que está siendo desenrollada. (Pág. 6, líneas 21 a 26).

En consecuencia, la persona del oficio normalmente versada en la materia, incluiría el freno compuesto por un disco (26) y un actuador (28), adaptados para interactuar entre sí, para mantener la tensión de la tela (64) que está siendo desenrollada, enseñado en el documento D, en el aparato para el desenrollado de bobinas divulgado en el documento D1, para llegar así al objeto de las reivindicaciones 1 y 9 de la solicitud. Por lo cual, la reivindicación 9 se considera obvia.

De acuerdo lo anterior, las reivindicaciones 3, 6 y 9 cumplen el requisito de novedad (Art. 16), pero no cumple con el requisito de nivel inventivo (Art. 18).

Por su parte, la reivindicación 8 está afectada en el numeral 3 de esta comunicación.

6. Conclusión

Los requisitos de Patentabilidad de la presente solicitud están afectados así:

Ítem	Documento	Reivindicaciones afectadas	Requisito que afecta
D1	US 3'512.728	1 a 9	Novedad/Nivel Inventivo
D2	US 3'216.671	1	Novedad
D3	US 2007/0170301	3	Nivel inventivo
D4	US 2007/0210202	6	Nivel inventivo
D5	WO 96/37427	9	Nivel inventivo

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de sesenta (60) días contados a partir del día siguiente de la fecha de notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Se invita al solicitante se sirva indicar, si así lo considera, su renuncia al término faltante de sesenta (60) días para dar respuesta a este requerimiento y presentarla por escrito.

Finalmente, se le recuerda al solicitante que si como respuesta a este requerimiento llegara a modificar el capítulo reivindicatorio y éste contenga más de diez (10) reivindicaciones, no pagará la tasa de modificación voluntaria pero sí la correspondiente al pago por reivindicación adicional.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única No. 10 de 2001.



JOSÉ LUIS SALAZAR LÓPEZ
Director de Nuevas Creaciones (c)

El anterior requerimiento fue notificado por fijación en lista, de fecha 2014-03-04

Elaboró: Monica Andrea Gutierrez Almonacid
Revisó: Sonia Andrea Diaz Pirazan

May 19, 1970

W. H. JOHNSON

3,512,728

UNCOILER

Filed Dec. 4, 1967

3 Sheets-Sheet 1

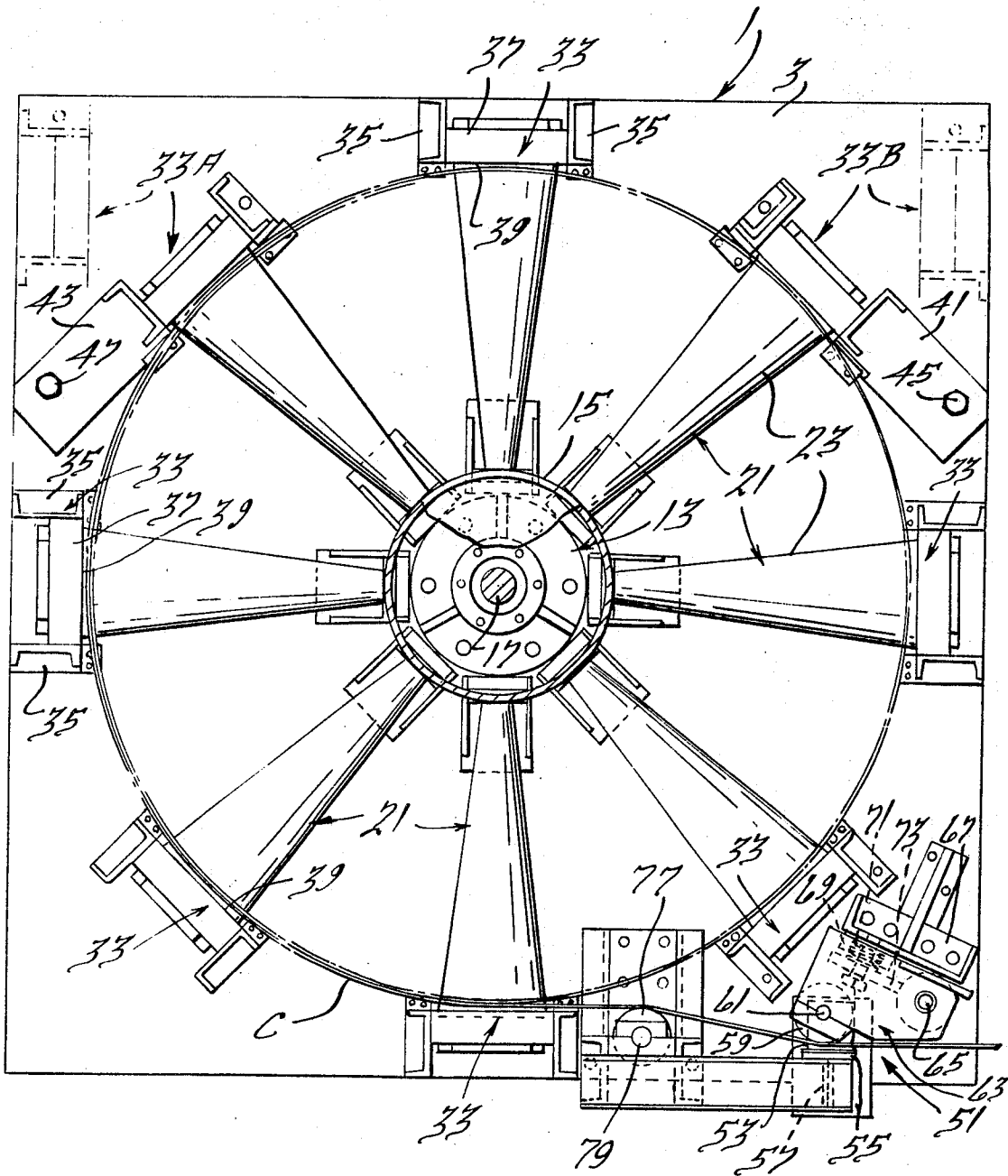


Fig. 1.

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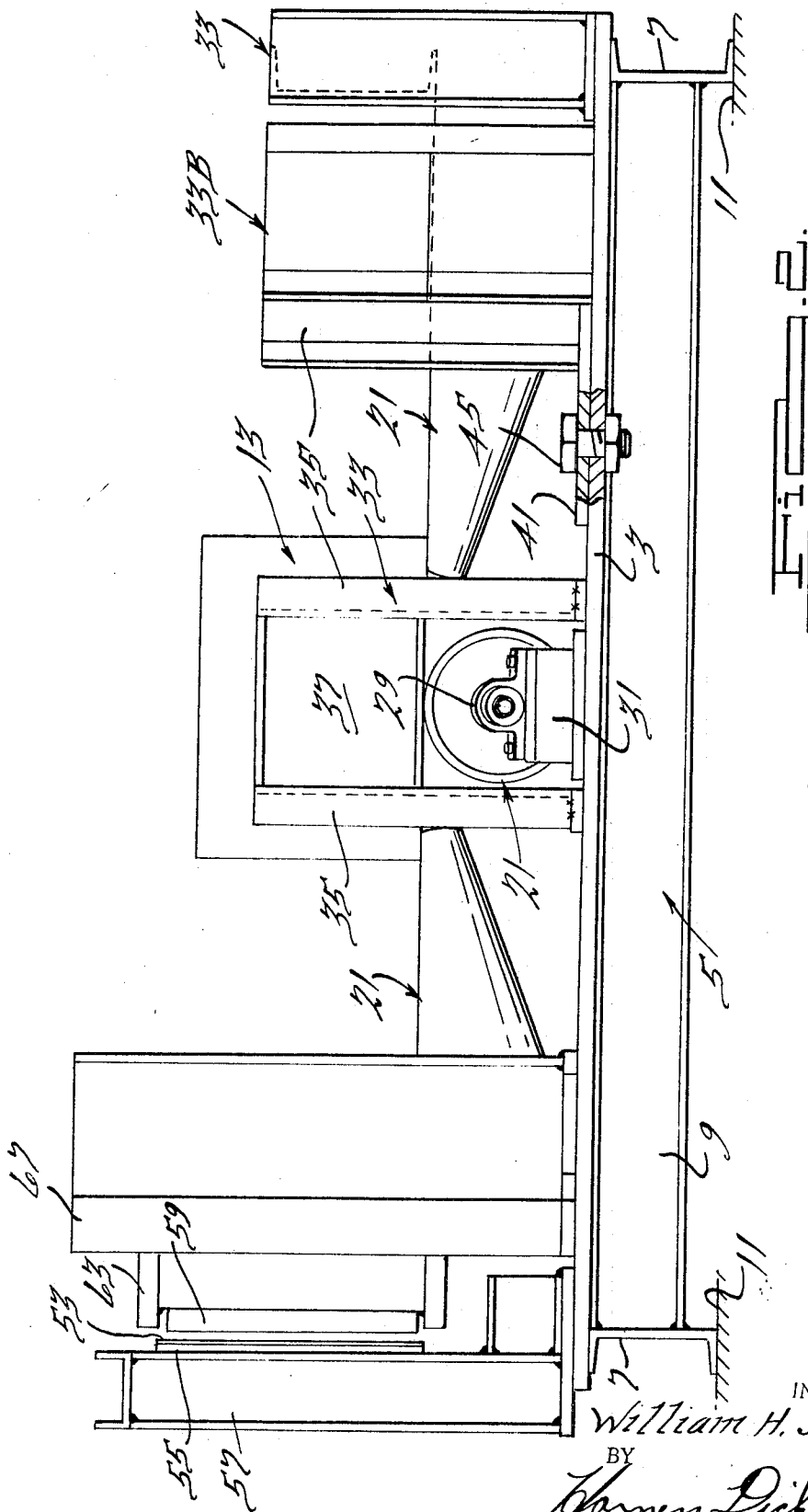
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UNCOILER

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3 Sheets-Sheet 2



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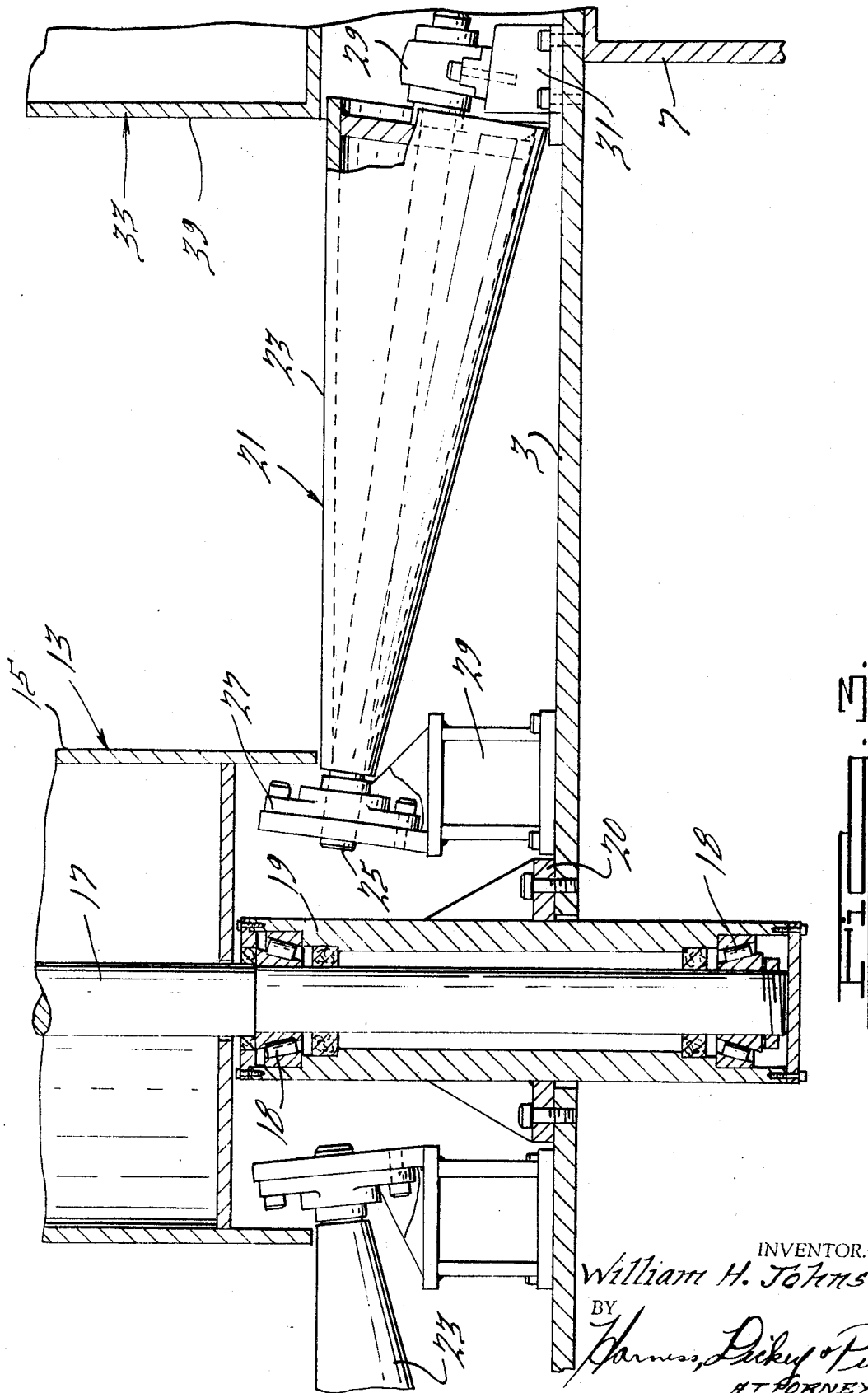
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3 Sheets-Sheet 3



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3,512,728
UNCOILER

William H. Johnson, Harrisonburg, Va., assignor, by
mesne assignments, to Tenneco Inc., Houston,
Tex., a corporation of Delaware
Filed Dec. 4, 1967, Ser. No. 687,827
Int. Cl. B21c 47/16

U.S. Cl. 242—78.6

13 Claims

ABSTRACT OF THE DISCLOSURE

An uncoiling apparatus for large coils of steel has a rotatable center core to receive the center aperture in the coil of steel. Radiating from the center core are a series of tapered rollers on which the coil of steel is supported. At the outer radial ends of the tapered rollers are a series of vertically extending fences. The uncoiler has a pay-out section which includes an automatically operated brake mechanism that places braking pressure on the strip of steel leaving the uncoiler when the pull or tension on the strip is reduced. When this happens, centrifugal force on the coil causes it to expand radially so that the outermost coil engages the surfaces of the fences and the resulting friction acts as a brake to reduce the rotation of the coil.

BACKGROUND OF THE INVENTION

In the automatic high speed production of metal parts made from strip steel, such as welded tubing, the strip steel is furnished in the form of large coils sometimes as large as 5 or 6 feet in diameter. The steel is unwound from these coils and fed through elaborate machinery to a tube mill (in the case of tubing) which rolls the flat steel strip into tubular shape and welds the abutting edges together. Various things can happen at the tube mill or manufacturing end of the procedure causing slowdown or even shutdown of the operation, and this of course is reflected back into what must be done with the coil of steel which has been rotating to furnish the raw material from which the tube is being made.

In the past, special equipment has been required to provide proper control of the rotating coil of steel to conform it to conditions downstream. Complications can ensue even though there may be a looper in the circuit. For example, in the case of slowdown, improper control of the uncoiler can result in overspinning and the strip may fan out upon the floor of the factory, since it is being paid out by the uncoiler at a greater rate than it is being used by the manufacturing equipment. This obviously is very hazardous to personnel and equipment in the neighborhood of the uncoiling apparatus. It is difficult to prevent with currently used apparatus, since, in the case of tubing, a typical installation would require a strip deceleration of 150 feet per minute in 1.5 seconds to avoid overrun and dumping of the strip on the floor.

BRIEF SUMMARY OF THE INVENTION

It is the purpose of the invention to provide a relatively simple method and apparatus for the uncoiling of large coils of steel which is safe and reliable in operation and which eliminates the need for elaborate controls and the danger of overload on the drive motors used in the production line.

The invention accomplishes this purpose by mounting the coil of steel on a series of radially extending tapered rollers and by surrounding the outer periphery of the rotatably mounted coil with a series of fences against which the coil can expand in the event that it is rotating at a greater speed than the rate at which the strip is being consumed by the production apparatus downstream from

2

the coil. When the coil expands by centrifugal force into contact with the retaining fence, a frictional drag is exerted on the strip stock and this is transferred back into the coil which, in essence, makes each wrap of the coil act as a brake for the next wrap. In this way the coil automatically brakes itself by means of its radial contact with the fences.

In addition, the uncoiler may employ at its outlet end an automatically operated brake mechanism which applies brake shoe pressure against the strip when tension on the strip is reduced due to consumption of the steel at a lower linear speed than it is paid out by inertia due to rotation of the coil. The brake mechanism is such that normal consumption of steel providing for normal tension on the strip results in withdrawal of the brake mechanism so that the strip is paid out without tension or resistance from the brake mechanism. In fact, there is a substantially tension-free pay-off because of this and because of the differing diameters of the tapered rollers which compensate for speed variation at the varying diameters of the coil.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view (partly broken away) of an uncoiling apparatus embodying the principles of the invention:

FIG. 2 is a side elevation taken from the right side of FIG. 1; and

FIG. 3 is an enlarged section, partly broken away, along a radial plane in FIG. 1.

DESCRIPTION OF THE INVENTION

The uncoiling apparatus 1 for coil C has a base plate 3 which may itself be self-supported upon a suitable framework 5, composed of channel-shaped members 7 and 9, which, in turn, is supported upon the factory floor 11. Located centrally of the plate 3 is a freely rotatable spindle structure 13 comprising an outer drum or coil centering roll 15 which is suitably secured to and mounted upon a vertical shaft 17. The lower end of the shaft 17 is rotatably mounted on a tapered bearing structure 18 that is carried by a spindle support housing 19 which is applied by means of flanges 20 to the plate 3.

Extending radially from the centering drum 15 are eight roller-type coil support structures 21. As seen best in FIG. 3, each of the structures includes a tapered roller 23 which is arranged so that the top of its conical surface extends horizontally or parallel to the floor and perpendicular to the vertical axis of the shaft 17. This is accomplished by arranging the rotatable shaft 25 on which the roller 23 is mounted so that it extends at an angle as seen in FIG. 3. The opposite ends of each of the shafts 25 are mounted in substantially friction-free bearing structures 27 and 29 which may in turn be mounted on suitable pedestal supports 29 and 31 on the plate 3. The various diameters of the rollers 23 which engage the coil are proportional to the diameters of the coil wraps so the taper of the rollers 23 will compensate for the linear speed variation along a radius of the coil and will tend to even out the relative surface speeds so that relatively little friction occurs between the edges of the coil and the rollers. The coils are thus centered by drum 15 and supported for free, substantially unresisted rotation by the rollers 23.

Located at the outer radial end of each of the tapered rollers structures 21 is a fence structure 33 which comprises support channels 35 on either side and a fence plate 37 rigidly secured between and to them and presenting a face 39 directed toward the centering spindle 15. The fence structures 33A and 33B may be made movable (i.e., made gates) by securing them to plates 41 and 43 which are pivoted by means of pins 45 and 47 to the support plate 3 so that the fence structures 33A and 33B can be swung outwardly to the dotted line position indicated in FIG. 1.

3

When the gates 33A and 33B are swung to the outermost position, a side of the uncoiler is opened so that a fork truck carrying a coil of steel can drive over the uncoiler and center a coil on the drum 15 and load the uncoiler.

The uncoiler 1 has a pay-out or outlet section 51 which appears adjacent the lower right-hand corner in FIG. 1. The actual outlet or exit point for the strip of steel occurs between a flat vertically extending brake shoe surface 53, which is secured to the face of a back-up plate 55 that is attached to the beam structure 57 mounted on the plate 3, and a floating lead-out roller 59 which is mounted upon a freely rotatable vertical shaft 61 which is secured on a pivot arm 63. The pivot arm 63 is mounted upon a freely rotatable pivot shaft 65 which is supported on a back-up structure 67. Structure 67 is secured to the top of the plate 3 and it includes a spring retainer 69 for the coil spring 71 which is pressing against a ledge 73 on the arm 63. A bolt 75 is provided to adjust the compression of spring 71.

A freely rotatable, fixed position lead-out roll 77 is mounted on rotatable shaft 79 that is carried by beam structure 57. Its surface is aligned with that of the adjacent fence face and the roll facilitates pay-out of the strip when it is in the expanded condition. During the normal run condition the coil wraps will be tight due to tension on the strip and out of contact with roll 77.

While the uncoiler of this invention is capable of other uses one important application is in the manufacture of tubing from strip steel supplied as raw stock in the form of coils. In this application the steel strip which is paid out by the uncoiler 1 goes first to a looper (not shown), which is commercially available equipment, and from the looper to the tube mill (not shown) where it is formed into tubing. The looper is in essence an accumulator or retainer which will hold a predetermined amount of strip stock between the uncoiler and the tube mill so that when the coil of steel is entirely depleted the tube mill will continue to run on the strip stored by the looper. This provides times for a new coil C of steel to be placed in the uncoiler 1 and welded to the trailing end of the strip extending out of the looper.

After the new coil is put into the uncoiler 1 and attached to the end of the strip in the looper, the looper will refill and accelerate the speed of uncoiling to as much as 500 feet per minute and this continues until the looper is filled again. At the precise moment when the looper is filled it is necessary to decelerate the pay-off from the uncoiler 1 back to the consumption speed of the tube mill (usually 300 feet per minute) in 1.5 seconds, otherwise the strip overruns and dumps out on the floor.

In the uncoiler 1 the coil is automatically braked to prevent this dumping. When the tension on the strip is reduced due to lowered consumption by either the looper or tube mill the force of the strip on the roller 59 is reduced and this enables the spring 71 to push the strip against the brake shoe 53, thus putting a friction drag on the strip. Also, due to the lowered tension on the strip centrifugal force of the rotating coil causes the various wraps of the coil to expand outwardly and the outermost wrap comes in contact with the various faces 39 of the retaining fences. These confine the coil and exert a large frictional drag on it and this is transferred back into the coil so that each coil wrap is in essence a brake for the next wrap. In this manner the coil quickly brakes itself in an automatic manner responsive to reduced tension in the strip.

During normal consumption of the strip paid out from the coil, the unit is free-wheeling since the strip tension will tighten up the coil and pull the outer wrap away from the fences and pivot the roller 59 away from the brake shoe 53. Furthermore, the variable diameter of the tapered roller bearings 23 on which the edges of the various wraps of the coil are supported rotate at a linear speed corresponding to that of the coil wraps to substantially eliminate frictional drag due to slippage.

4

Modifications may be made without departing from the spirit and scope of this invention.

What is claimed is:

1. In an uncoiler for large coils of strip steel or the like, a rotatable centering spindle adapted to receive the core of a coil, a coil supporting and rotating bearing structure comprising a plurality of freely rotatable bearings extending around the spindle and adapted to support the coil on one of its side faces, and fence means surrounding the bearing structure and spindle and adapted to be engaged by a coil under expansion due to centrifugal force and exert a braking friction on the coil.

2. An uncoiler set forth in claim 1 wherein the bearing structure comprises a plurality of angularly spaced radially extending tapered roller bearings whose diameter increases with the radial distance from the spindle and whose axes are inclined to the horizontal so that a top coil contacting element of the tapered surface extends at right angles to the axis of the spindle.

3. An uncoiler as set forth in claim 2 wherein said fence means includes a plurality of angularly spaced individual fence members.

4. An uncoiler as set forth in claim 3 wherein said individual fence members are located at the outer radial ends of the tapered roller bearings.

5. An uncoiler as set forth in claim 4 wherein certain of said fence members are movably mounted to serve as gates to provide for entry and loading of a coil on the spindle.

6. An uncoiler as set forth in claim 5 including an automatic braking structure arranged to exert a frictional drag on a strip being paid out by the coil upon reduction in tension on the strip.

7. An uncoiler as set forth in claim 6 wherein said braking structure comprises a brake shoe adapted to engage one side of the strip being paid out and a roller adapted for friction-free engagement with the other side of a strip being paid out and movable toward and away from the brake shoe.

8. An uncoiler as set forth in claim 7 including a fixed position pay-out roller engageable with the strip on the same side as said brake shoe.

9. An uncoiler as set forth in claim 1 including an automatic braking apparatus for exerting friction on the strip being paid out and responsive to decreased tension in the strip to effect braking.

10. In an uncoiler for large coils of strip steel or the like, a rotatable centering spindle with a vertical axis adapted to receive the core of a coil so that the coil axis is vertical, a coil supporting and rotating bearing structure comprising a plurality of freely rotatable bearings extending around the spindle and adapted to support the coil on its bottom side face, and fence means surrounding the bearing structure and spindle and providing a vertical cylindrical surface adapted to be engaged by the outer wrap of a coil under expansion due to centrifugal force and exert a braking friction on the coil.

11. An uncoiler as set forth in claim 10 wherein said fence means comprises a plurality of angularly spaced vertically extending non-rotatable fence members located around substantially the entire outer circumference of a coil supported on said bearing structure.

12. An uncoiler as set forth in claim 11 wherein at least one of said fence members is movably mounted to serve as a gate to provide for entry and loading of a coil on the spindle.

13. In an uncoiler for large coils of strip steel or the like, a centering spindle with a vertical axis adapted to receive the core of a coil so that the coil axis is vertical, a coil supporting bearing structure adapted to support the coil on its bottom and horizontal side face for rotation about the coil axis, said bearing structure comprising a plurality of angularly spaced freely rotatable tapered roller bearings extending radially from the spindle and whose diameters increase with the radial distance

5

from the spindle and whose axes are inclined to the horizontal so that a top coil contacting element of the tapered surface of each extends at substantially right angles to the axis of the spindle and define together a substantially horizontal plane of support for the coil, and a plurality of angularly spaced vertically extending non-rotatable fence members extending around substantially the entire outer circumference of a coil and located adjacent the outer radial ends of the tapered roller bearings and adapted to be engaged by the outer wrap of a coil under expansion due to centrifugal force and exert a braking friction on the coil.

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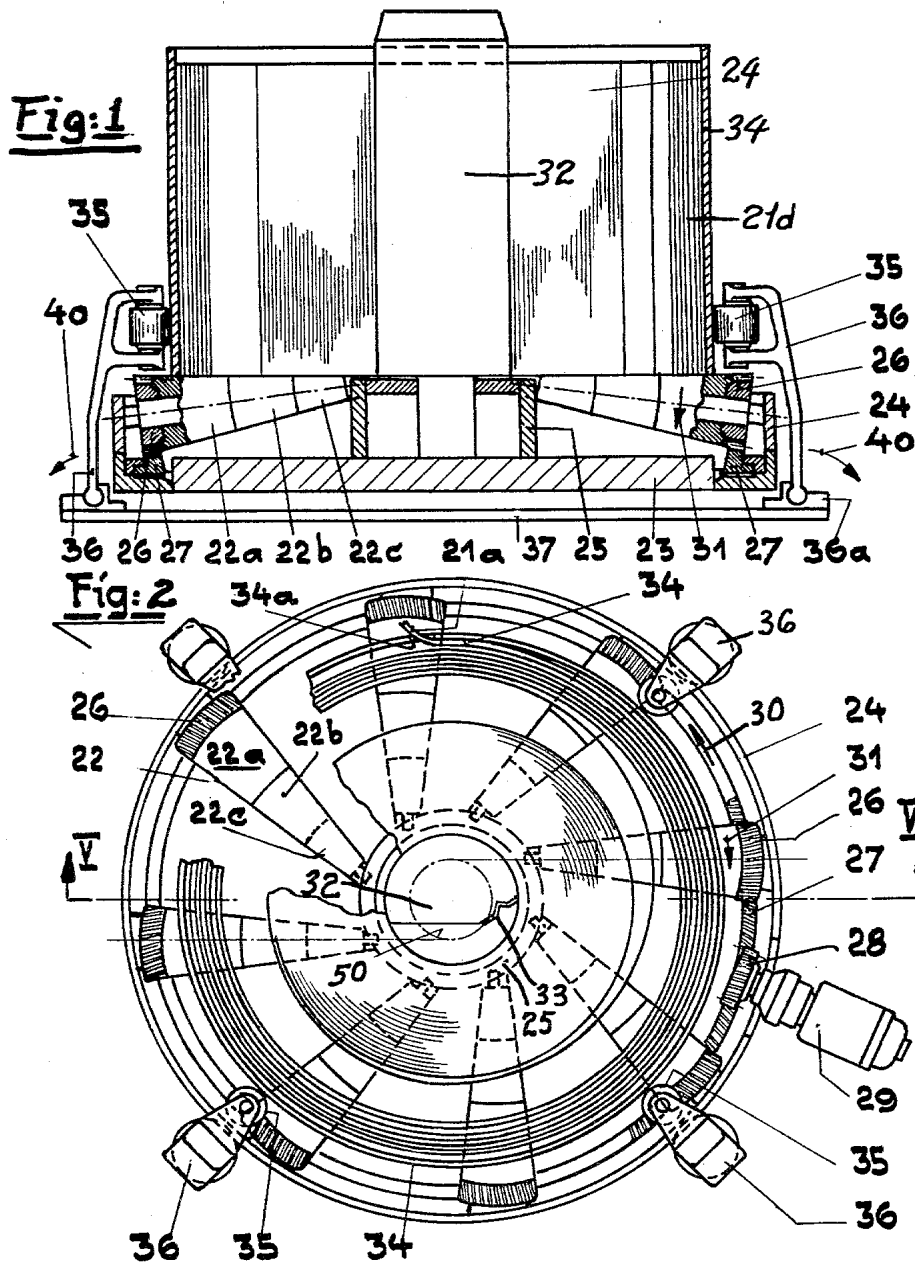
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3,216,671

Filed June 28, 1962



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3,216,671

APPARATUS FOR LOOSENING TIGHTLY WOUND REELS OF STRIP

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Filed June 28, 1962, Ser. No. 205,975

Claims priority, application Germany, July 25, 1961,
Sch 30,037

4 Claims. (Cl. 242—78.1)

Thin metal sheets are usually rolled in the form of strip. Due to the strong reduction in the cold rolling mill, the rolled strip is usually very hard and must therefore be annealed in an inert gas atmosphere. Strip which requires, in view of the material properties or the quality required by the user, longer annealing, is usually annealed in the reeled up condition, that is to say, in the form of a bundle. For this annealing of whole bundles, there are known many constructions of furnaces, capable of receiving even the heaviest bundles with the widest strip. Known annealing furnaces with inert gas atmosphere operate in such a way that, in addition to the direct transfer of heat by radiation, heat is also indirectly transferred by the circulating inert gas. The fan-circulated gas has here the object of distributing the heat created at the inner walls of the furnace uniformly over the interior and to the surfaces of the annealing material which are remote from the furnace walls and are not affected by direct radiation.

During the annealing of a tightly wound strip bundle, as it is received from the cold rolling mill, the heat penetrates only from the edges, that is to say from the end faces of the bundle, into the individual turns, because there is a layer of air between each turn, acting as an insulator. In consequence, the edges of the strip are exposed to the heat for a much longer period than the centre. This, as well as the fact that the centre of the windings of a tightly wound strip is only insufficiently affected by the inert gas, causes certain differences in the quality of the sheet, apparent especially in a coarser grain structure along the edges.

In order to eliminate these disadvantages, it is already known to open tightly wound reels coming from the mill by rewinding the same. During this rewinding, a wire or thread, particularly of nylon, is wound into the newly formed reel, and this is removed after the rewinding is finished. In this manner there is formed an open reel in the shape of a spiral, with spaced individual turns through which the inert gas may flow. This method of open annealing has been found very successful, especially because the heating up rate of the reel to be annealed is considerably improved.

However, these known rereeling devices for carrying out the rereeling described above are very complicated, bulky, and occupy much space. First, in order to achieve the smooth run-off of the strip from the tightly wound reel, the strip must first be tensioned, and thereby necessarily be stretched. Down-stream of the tensioning device, the strip must be supplied to the reeling mechanism practically without tension, and the strip, together with the thread, must be loosely fitted over the last turn. Particular difficulties are encountered where thicker strip of hard and brittle material is to be re-reeled, because the strip must be given a different radius of curvature for every successive turn. In order to realize this object, expensive and complicated electric controlling and synchronizing arrangements are necessary for regulating the run of the strip during the re-reeling. A further disadvantage is that the thread to be incorporated, usually of nylon, must have a certain minimum thickness, in order to withstand the stresses imposed on it during the pulling out. Thus,

there result very large reel diameters, especially during the re-reeling of very thin strip.

The present invention has the object of providing a method and an apparatus, whereby these difficulties and drawbacks may be avoided.

According to the invention, the tightly wound strip is placed with one face on a support provided with a fixed, non-rotating core, and the outer winding is slackened until it forms a sufficiently large circle and may be mounted in a cylindrical outer shell, which is rotatable and surrounds the support and the reel, so that by rotating this outer cylinder in the appropriate direction one winding after the other is pulled off the smaller, tightly wound reel, forming a larger diameter reel; during the pulling off, a force delaying the radially expanding movement is applied, preventing the firm contact between a turn and the preceding turn. In this manner, an open reel with gaps between the individual turns is formed. Starting with the outermost turn, the individual turns are loosened and given a larger diameter, whilst the innermost turn may remain in its previous position. The strip itself need not be stretched or pass through any tensioning or straightening devices; this is of special advantage in the case of heavy gauge or brittle materials, and with materials with sensitive surfaces.

Of importance is also a further feature of the invention, namely that the force necessary for delaying the expansion of the turn running off the tightly wound reel, may be provided by a mechanically produced braking effect. In this way, the method of the invention may be adapted to the conditions and requirements, producing an optimum output and working rate for the processing of any kind of strip.

An apparatus embodying these features is very small, and requires only little more space than the diameter of the expanded reel. The device is simple, cheap, of very sturdy construction, reliable in operation, and has a long working life.

In a preferred embodiment of this apparatus, the supporting surface for receiving the reel comprises several conical rollers, arranged in a star-like manner about a stationary non-rotating core, wherein the conical rollers are positioned obliquely in relation to the radial of the core. This construction has the advantage of requiring no further means in order to delay the expansion movement of the turns pulled off the reel. Due to the oblique position of the taper rollers, the turn is given a bias preventing it from resting completely against the preceding outer turn.

This device for carrying out the method of the invention, comprises only a single working station with one driving unit, eliminating the control and synchronizing arrangements that are necessary with known rereeling devices.

The invention will be further described, by way of example, with reference to the accompanying drawings, showing the preferred embodiment of the apparatus for carrying out the method according to the invention. The drawings are diagrammatic and restricted to the essential parts of the apparatus, whilst constructional details which are within the knowledge of the expert are omitted.

In the drawings:

FIG. 1 is a sectional side elevation of the apparatus of the invention; and

FIG. 2 is a plan view of the apparatus of FIG. 1.

In the embodiment illustrated, the force delaying the expansion movement of the strip is produced by a mechanically generated braking effect.

In this embodiment, the supporting surface for receiving the reel 21 consists of several conical rollers 22 with horizontal upper edges, arranged in star shape on a base

plate 23 between two rings 24 and 25 receiving their bearings. The roller arrangement is such that the conical rollers are not arranged radially, but tangentially about an imaginary inner circle 50. The axes of the rollers 22 form therefore an angle with the radii of the apparatus. The conical rollers are each subdivided, for example, into sections 22a, 22b, 22c. The outermost frusto-conical section 22a is fixed on the roller spindle, whilst the thinner sections 22b, 22c are independently rotatable on the spindle. The outer end of each roller 22 also carries a gear 26 mounted on the roller spindle. All the gears 26 engage into a gear rim 27 mounted in the base plate 23, connected to a pinion 28 with a motor 29, and rotatable in the direction of the arrow 30, so that all the conical rollers 22 are uniformly driven in the sense of the arrow 31. In view of the obliquity of the roller spindles, this gear drive requires a skew-bevel toothing.

The centre of the device has a fixed non-rotating core 32, having a clamping device 33 in the shape of a vertical slot in the core 32, serving to hold the inner strip end. The outer shell 34, mounted loosely on the conical rollers 22 and centered on the device preferably by means of several centering and guide rollers 35 in cross-wise arrangement, and acting on the shell from the outside, is driven by frictional contact with the rollers 22. Arms 36 carrying the centering or guide rollers 35, are rockable in a bearing 36a so that the guide rollers 35 may be rocked out in the direction of the arrow 40 to facilitate the fitting and lifting of the shell 34. The operation of this device is substantially the same as that described above. When the reel 21 and the outer shell 34 have been fitted, and the outer shell 34 centered by the guide rollers 35, the inner strip end is fixed to the core and the outer strip end to the outer shell 34 in the slot 34a. Then the driving mechanism is actuated and the conical rollers 22, and with them the outer shell 34 rotate. The inwardly facing roller sections 22b, 22c, rotatably mounted on the roller spindles, are at first held by the weight of the tight stationary reel 21, so that the lower edge of the strip cannot be damaged by sliding along the rollers 22.

The turns detached from the reel by the rotation of the shell 34 move radially outwardly and slide over the rotating roller sections 22a. Since the conical rollers 22a and their spindles form an angle with the radii of the apparatus, the turns passing over the revolving rollers are affected by a tension normal to the axial direction of the rollers 22, generating with the tangential force of the turns a force component radially directed towards the core. Thus, the turns are biased, preventing them from firmly resting against the preceding outer turns.

With the decreasing diameter of the tight reel during the re-reeling, the inner roller sections 22b and 22c are successively released and entrained by the revolving roller spindles. In order to produce a uniformly expanded reel, the outer shell 34 must be uniformly driven and slipping must be avoided between the rollers 22a and the outer shell 34, whereby the outer shell might be retarded relative to the movement of the conical rollers.

The embodiment described herein merely exemplifies the principle of the invention and may be modified by alterations in the assembly and in the construction, without departing from this principle. It is, for example, possible to design the apparatus with a stationary outer

shell whilst rotating the core and thereby the tight reel. It is also possible, in order to produce a high operating speed, to rotate the outer shell and the core in opposite directions. Furthermore, the device may be swivelable, in order to facilitate the mounting and removal of new reels.

What I claim is:

1. Apparatus for loosening a tightly wound bunch of strip, comprising: a base-plate, a stationary central vertical core mounted on the base-plate, an inner ring and an outer ring associated concentrically with the base-plate, a plurality of spindles each journaled at one end in the inner ring and at the other end in the outer ring, and each extending nearly but not quite radially towards the vertical axis of the core, a plurality of conical rollers, one on each spindle, these rollers collectively constituting a supporting means for the coil of strip, a rotatable cylindrical outer casing, large enough to enclose the bunch of strip in its ultimate loosened form when resting on the said supporting means, means for attaching the outer edge of the bunch of strip to the outer casing, and means for rotating the outer casing relatively to the inner vertical core, the deflection of the spindles from a radial direction being in such a sense as to retard the radially proceeding expansion of the individual turns, so as to leave a space between the turns as they are successively drawn off from the tightly wound bunch.

2. Apparatus for loosening a tightly wound bunch of strip as claimed in claim 1, each of the conical rollers being divided into sections, the outermost section of each roller, which is the section of greatest diameter, being mounted fast upon its spindle, whilst the remaining roller sections, which are of smaller diameter, are freely rotatably upon their spindles, and can only be driven by friction from their adjacent larger roller sections and from their spindles, and the apparatus further comprising means for driving all the roller spindles from a common source of power.

3. Apparatus for loosening a tightly wound bunch of strip as claimed in claim 2, the means for rotating the outer casing being constituted by the means for driving the roller spindles in conjunction with the friction between the roller spindles and the outer casing.

4. Apparatus for loosening a tightly wound bunch of strip as claimed in claim 1, further comprising means, acting upon the external surface of the outer casing, for guiding and centering the said casing, the said guiding and centering means being rockable outwards to facilitate placing the bunch of strip and the outer casing in position.

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MERVIN STEIN, *Primary Examiner*.

RUSSELL C. MADER, *Examiner*.



US 20070170301A1

(19) **United States**(12) **Patent Application Publication****Morello et al.**(10) **Pub. No.: US 2007/0170301 A1**(43) **Pub. Date: Jul. 26, 2007**(54) **SHEET METAL DECOILING DEVICE AND
MULTI-COIL DECOILING SYSTEM****Publication Classification**(51) **Int. Cl.****B65H 16/08** (2006.01)(52) **U.S. Cl.** **242/557; 242/564.5**(75) Inventors: **Frederick Morello**, Johnstown, PA
(US); **Todd Anderson**, Duncansville,
PA (US)

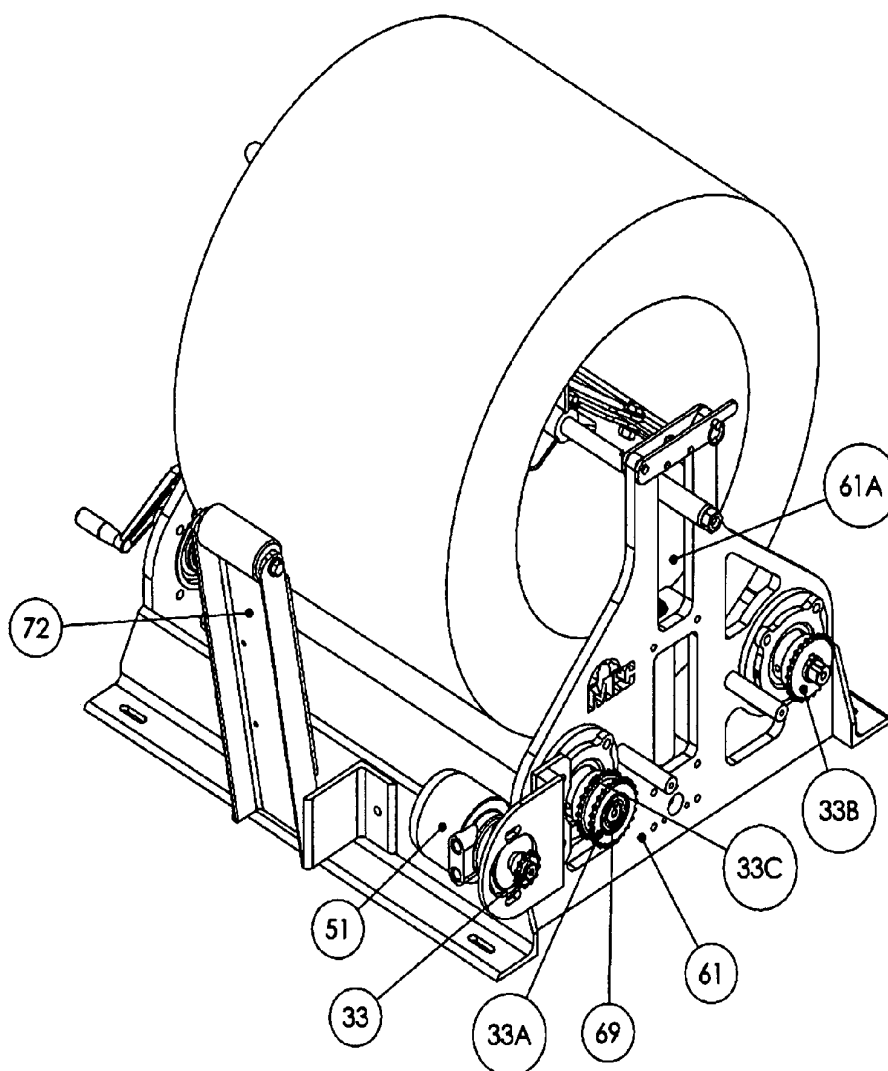
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ABSTRACT

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JONES DAY**222 East 41st Street****New York, NY 10017-6702 (US)**(73) Assignee: **M.I.C. Industries, Inc.**, Reston, VA(21) Appl. No.: **11/336,822**(22) Filed: **Jan. 23, 2006**

A decoiling device for decoiling a coil of sheet material includes first and second support rollers on which to support a coil of sheet material. The first and second support rollers are oriented such that their rotation axes are parallel to a first direction. The decoiling device also includes a frame supports the first and second support rollers, a rotatable mandrel, and first and second guide members. The first and second guide members are positionable at first and second sides of the frame, respectively, so as to limit movement of the coil of sheet material in the first direction. Multiple such decoiling devices can be configured together with a support member that supports the multiple decoiling devices to provide a mobile multi-coil decoiling system that is transportable from one location to another.



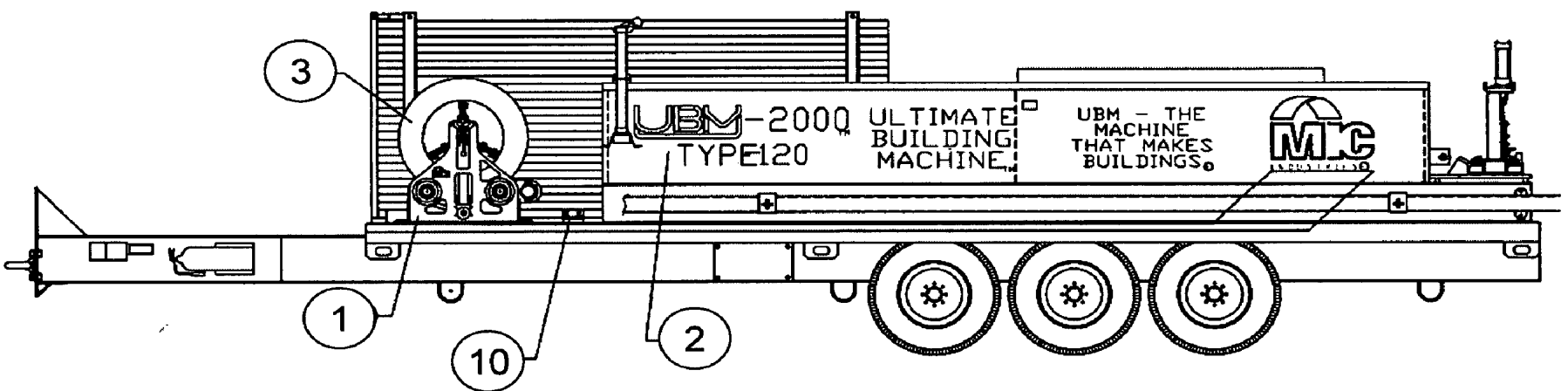


Figure 1

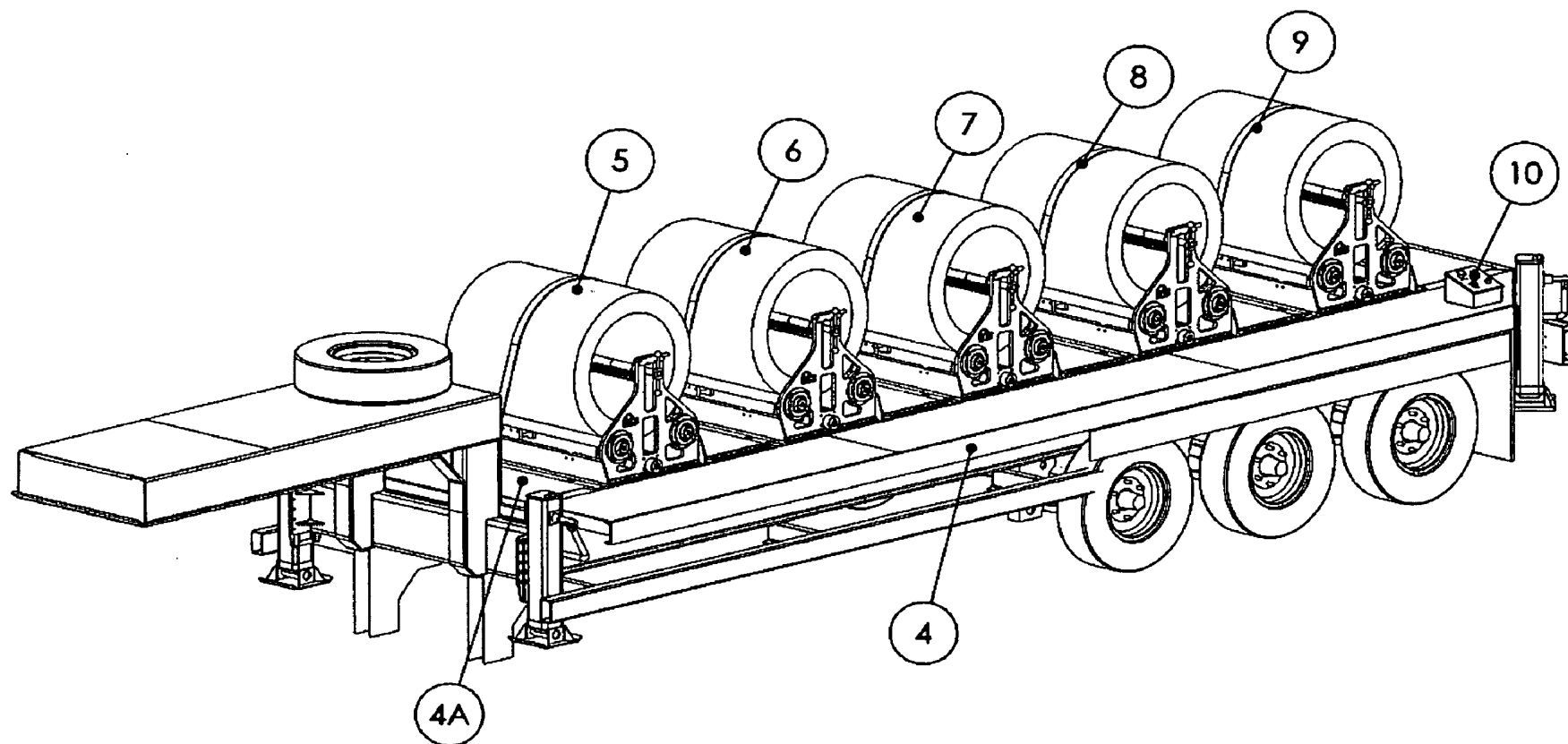


Figure 2A

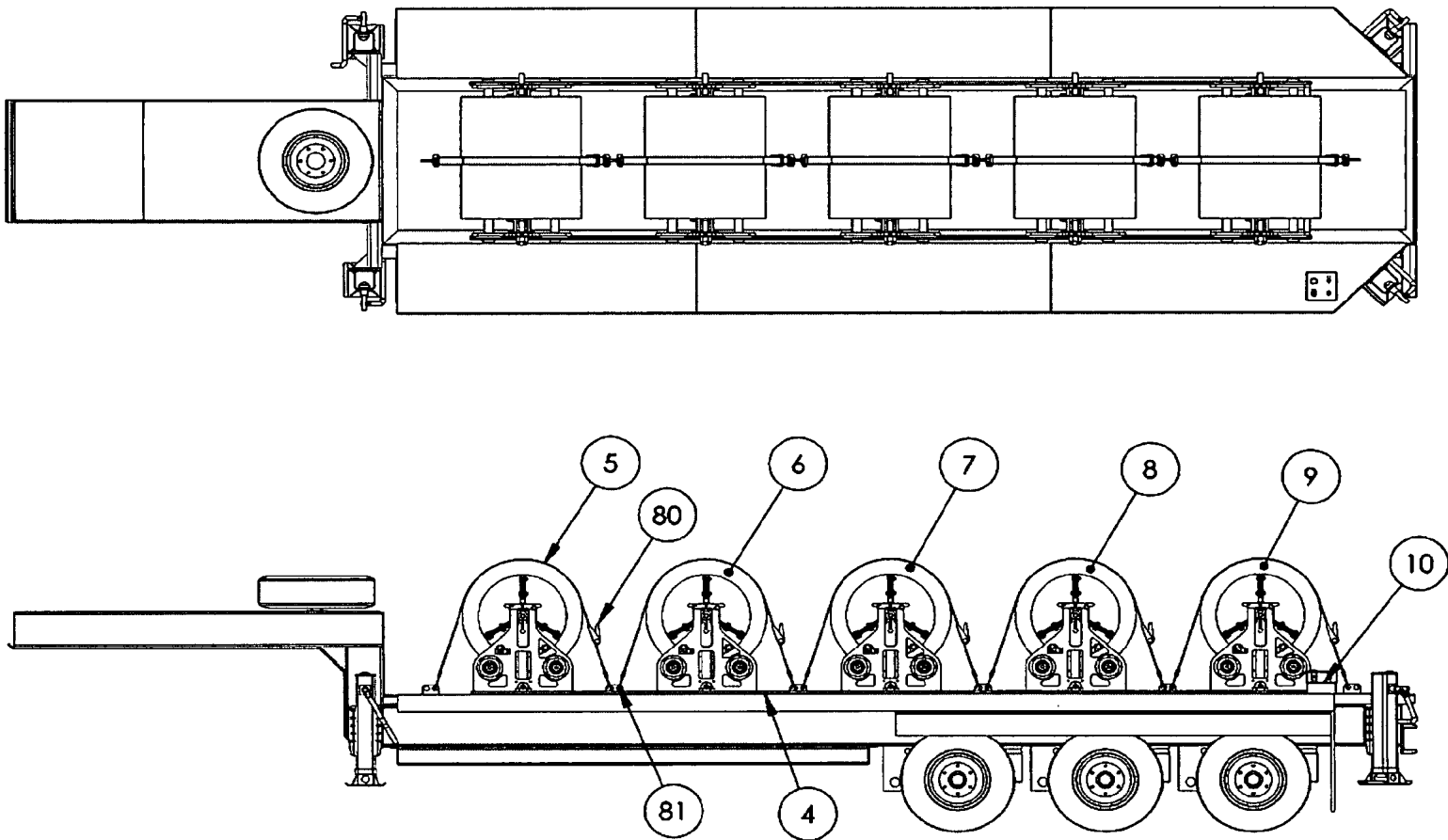


Figure 2B

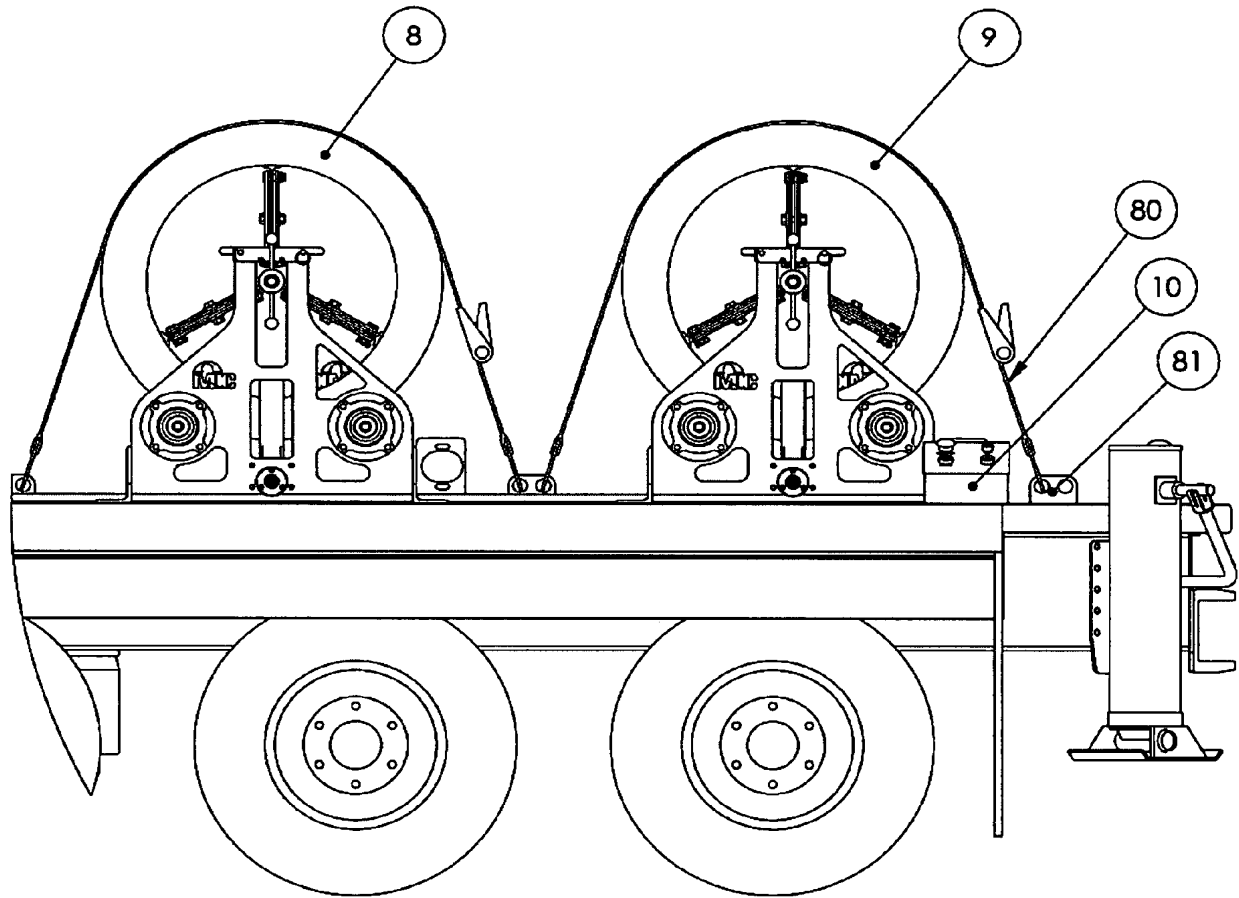


Figure 2C

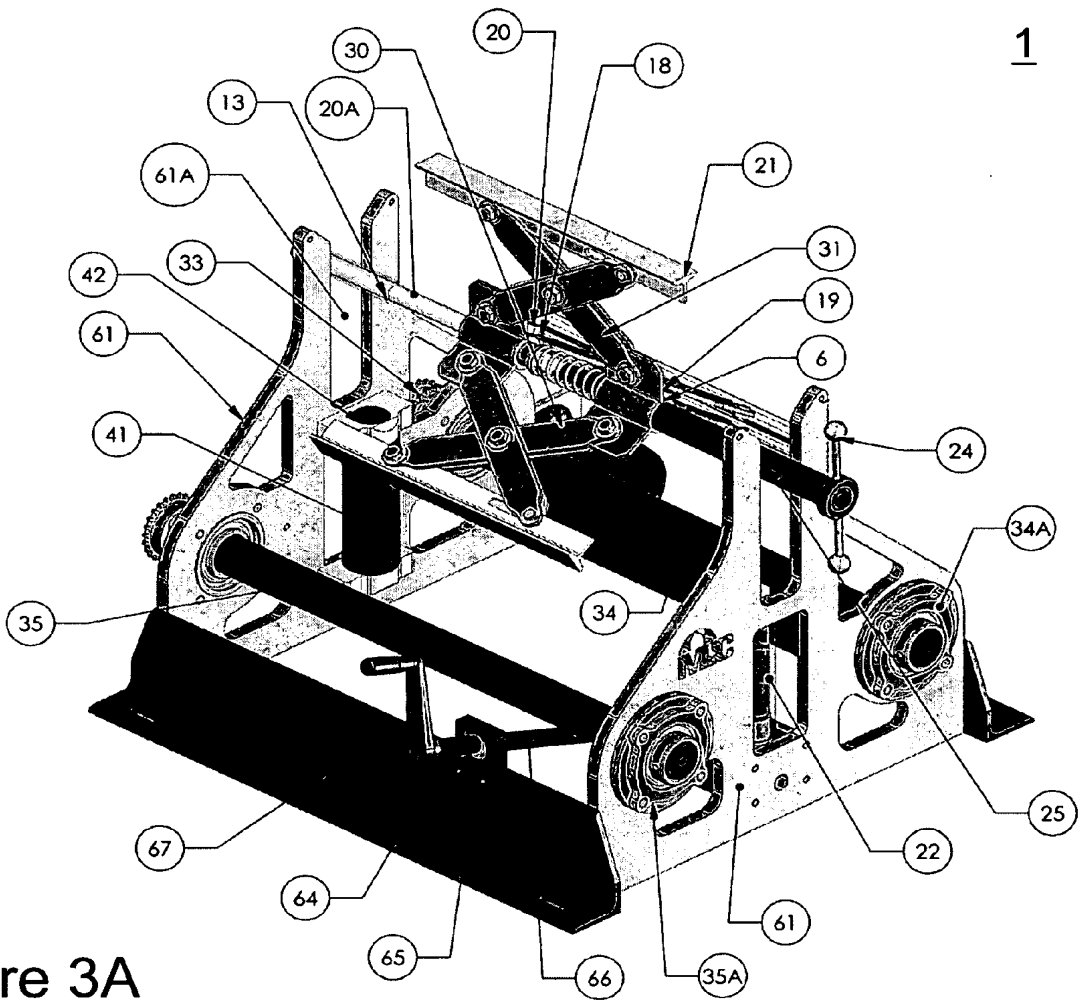


Figure 3A

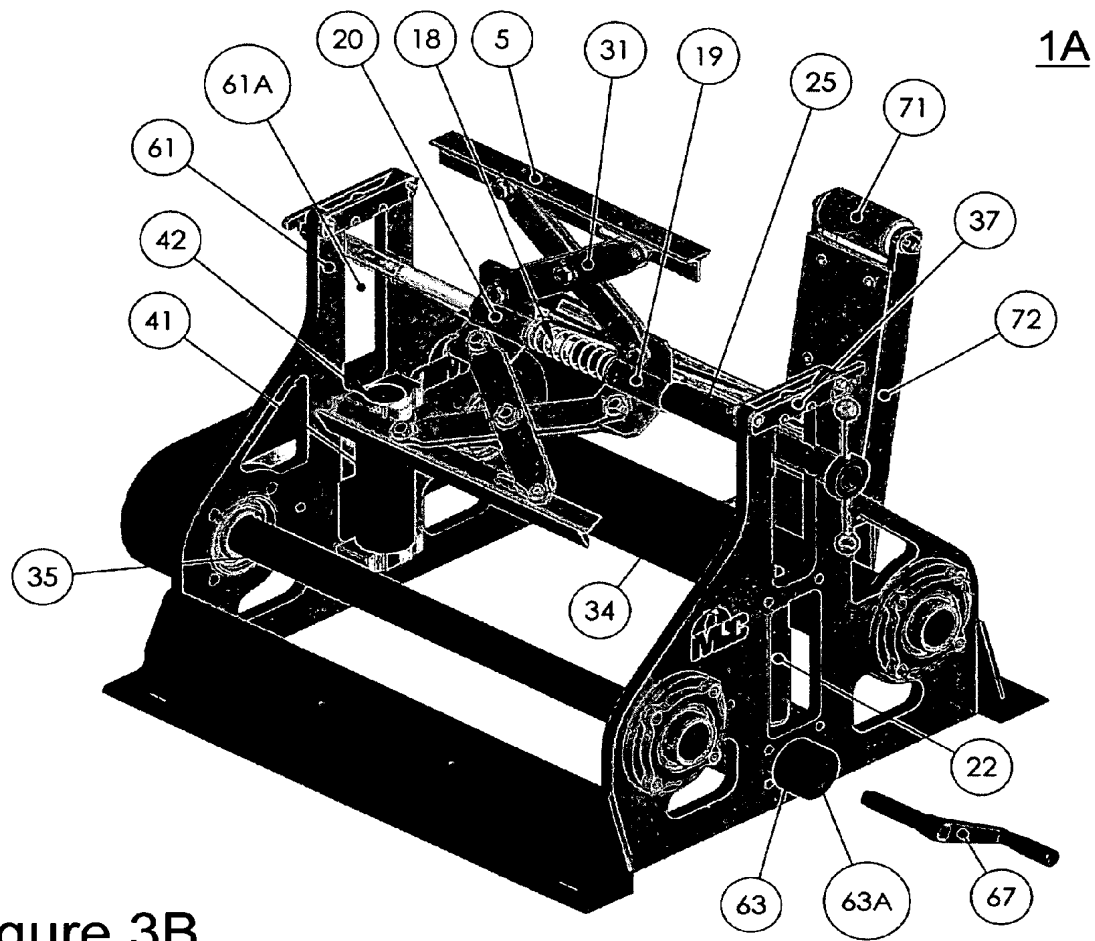


Figure 3B

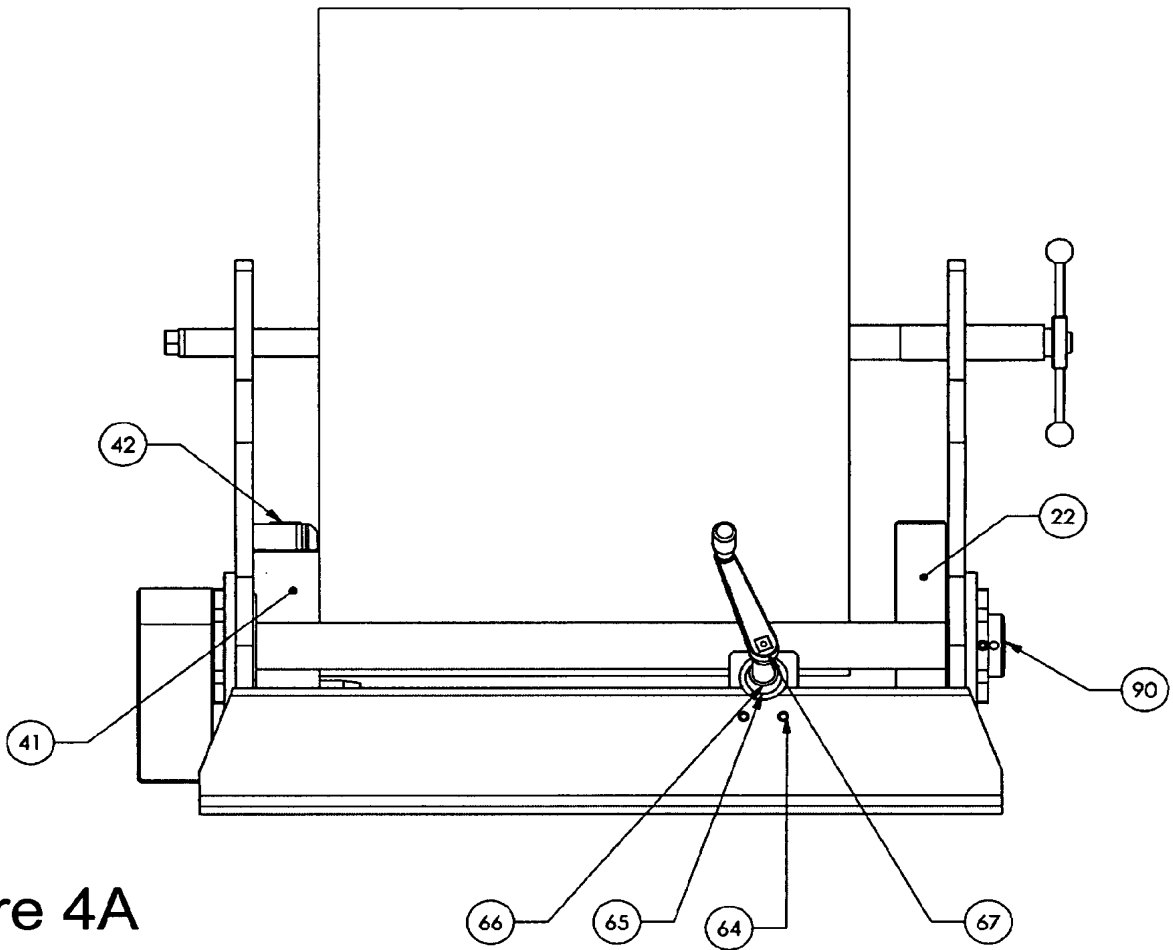


Figure 4A

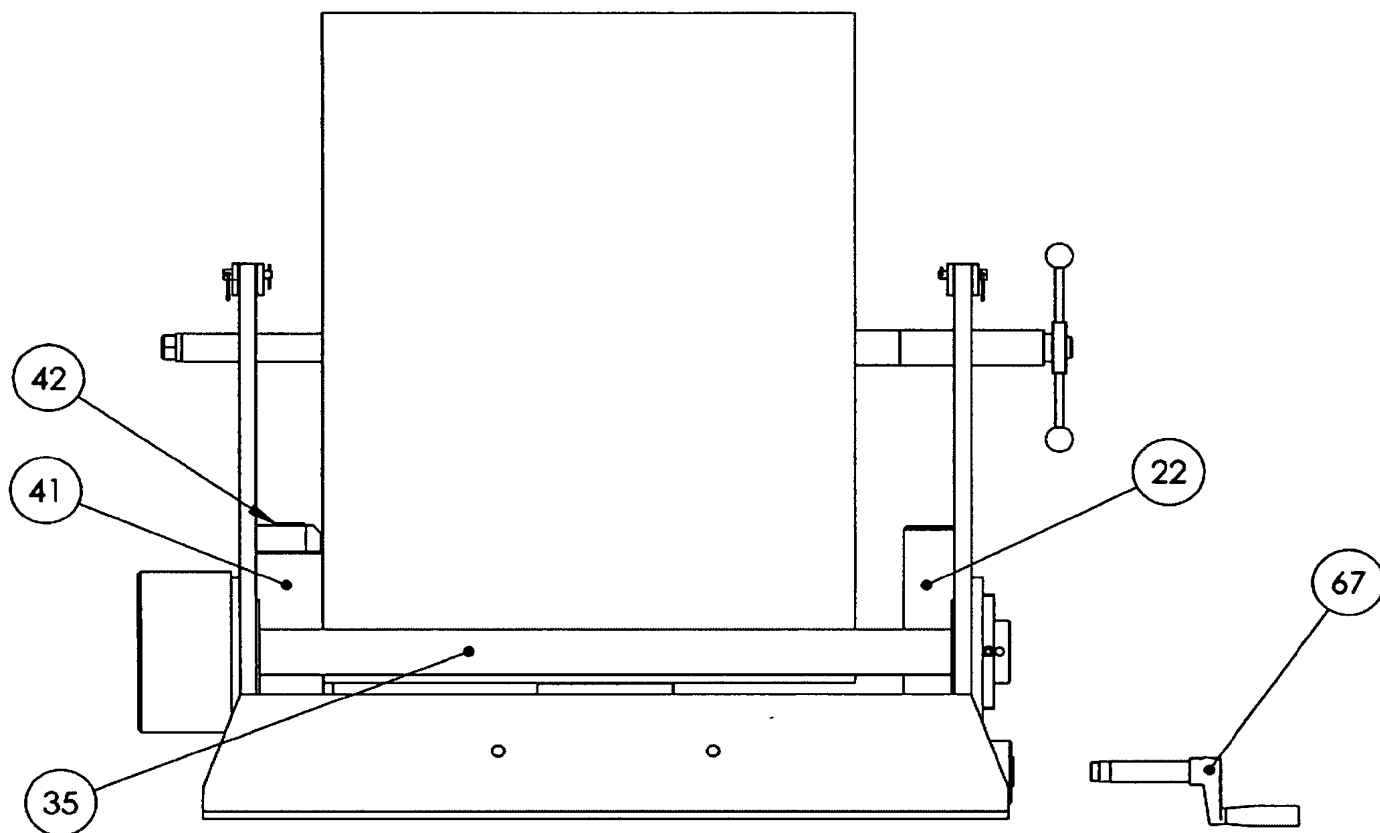


Figure 4B

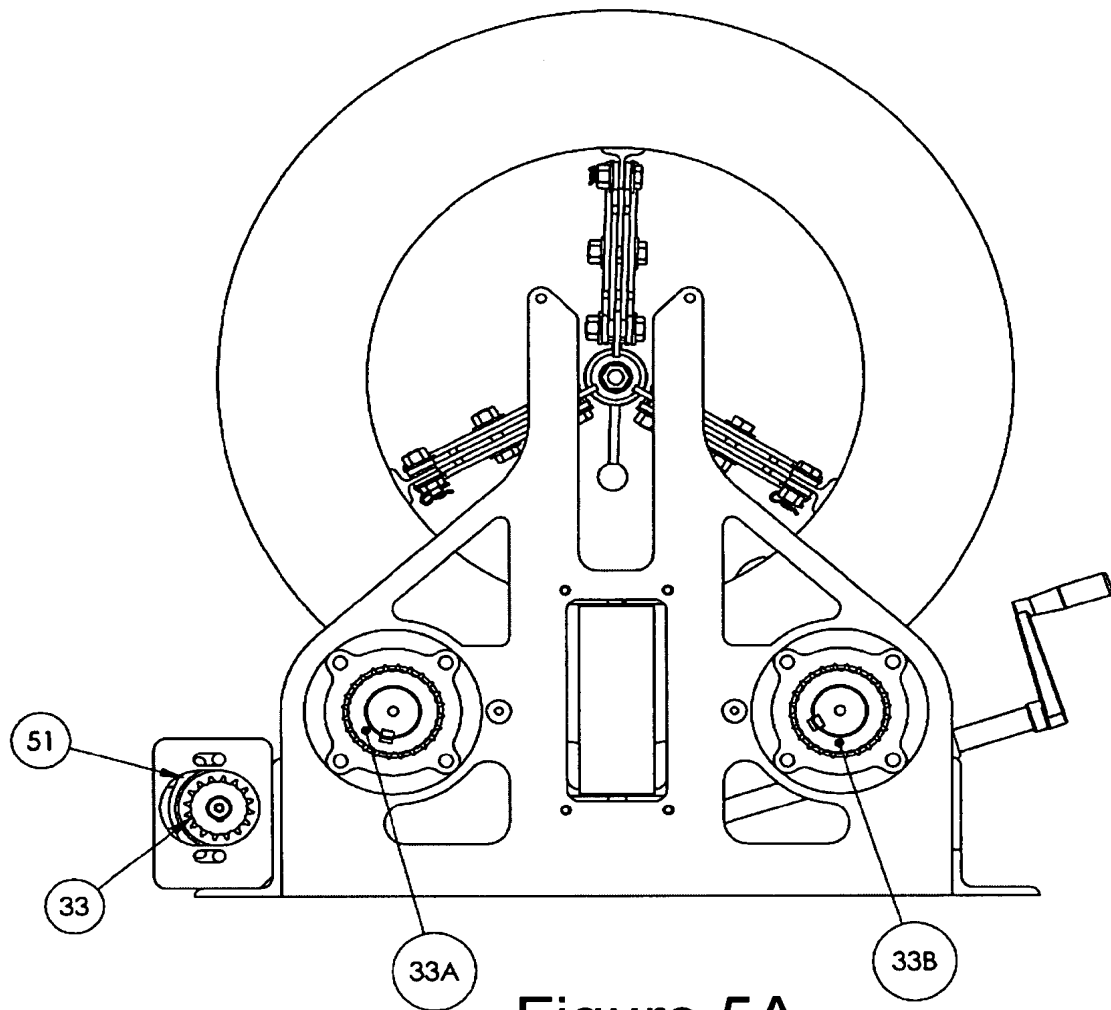


Figure 5A

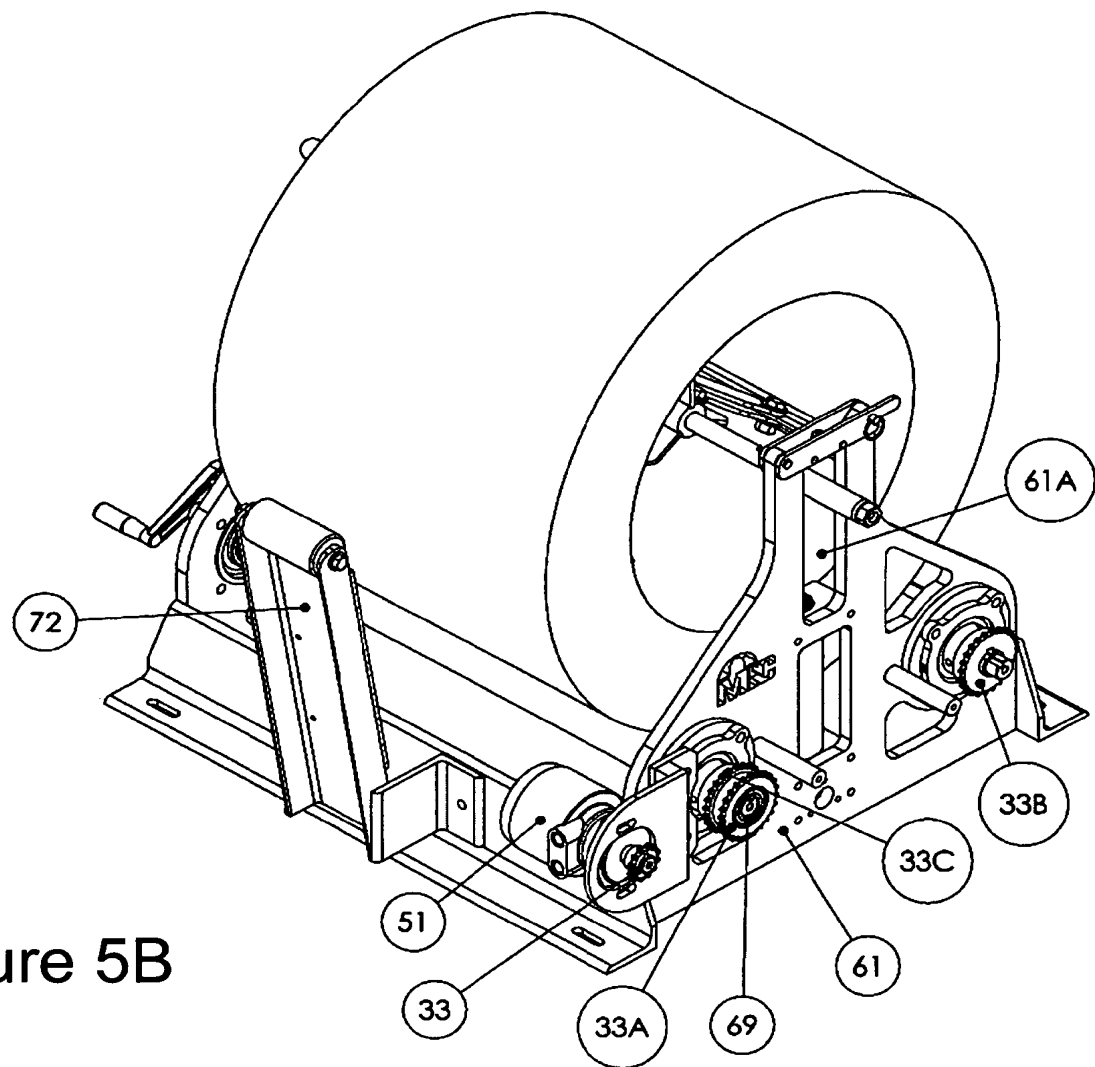


Figure 5B

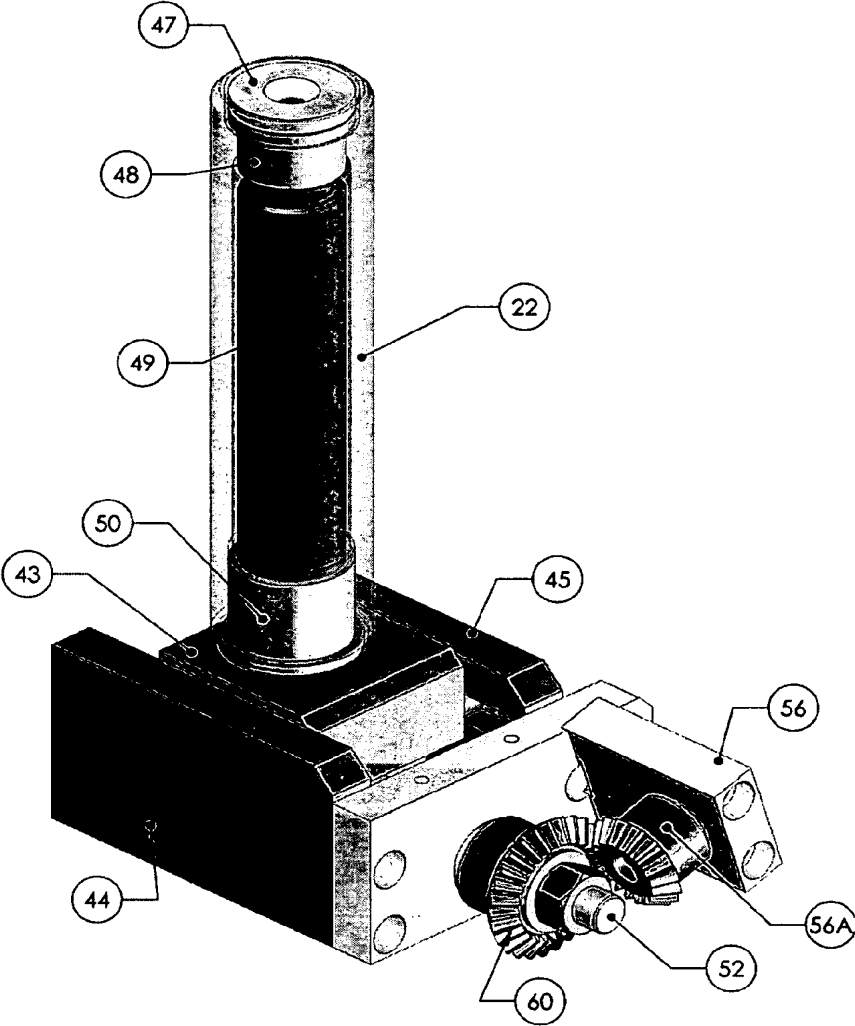


Figure 6A

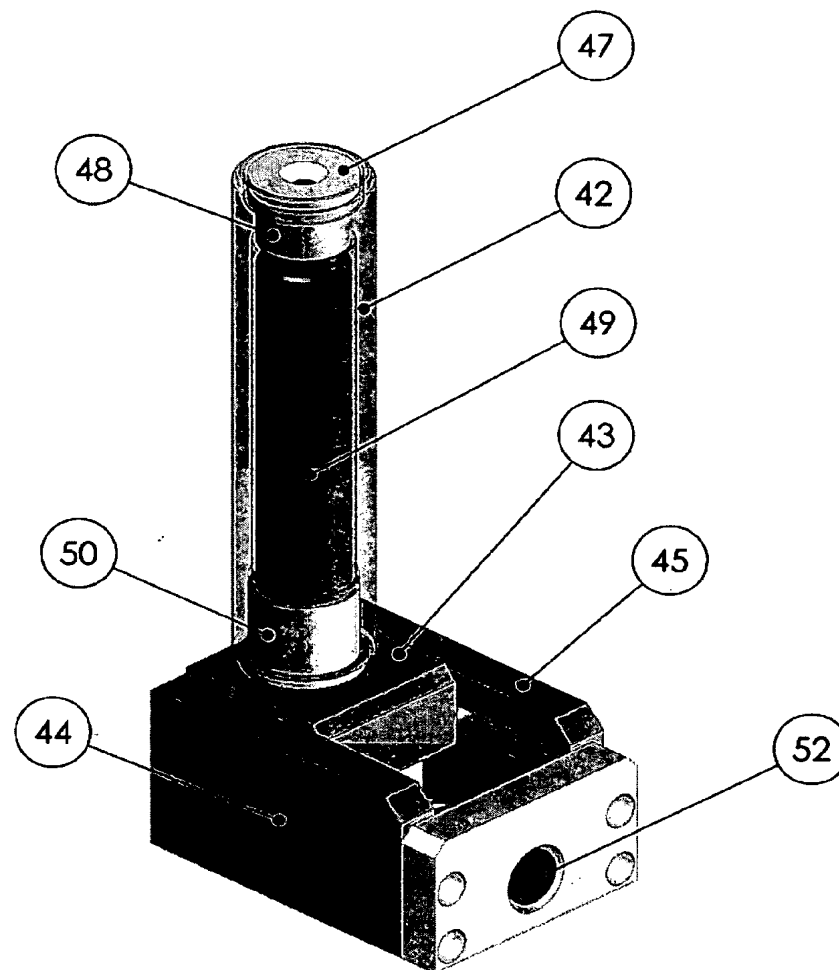
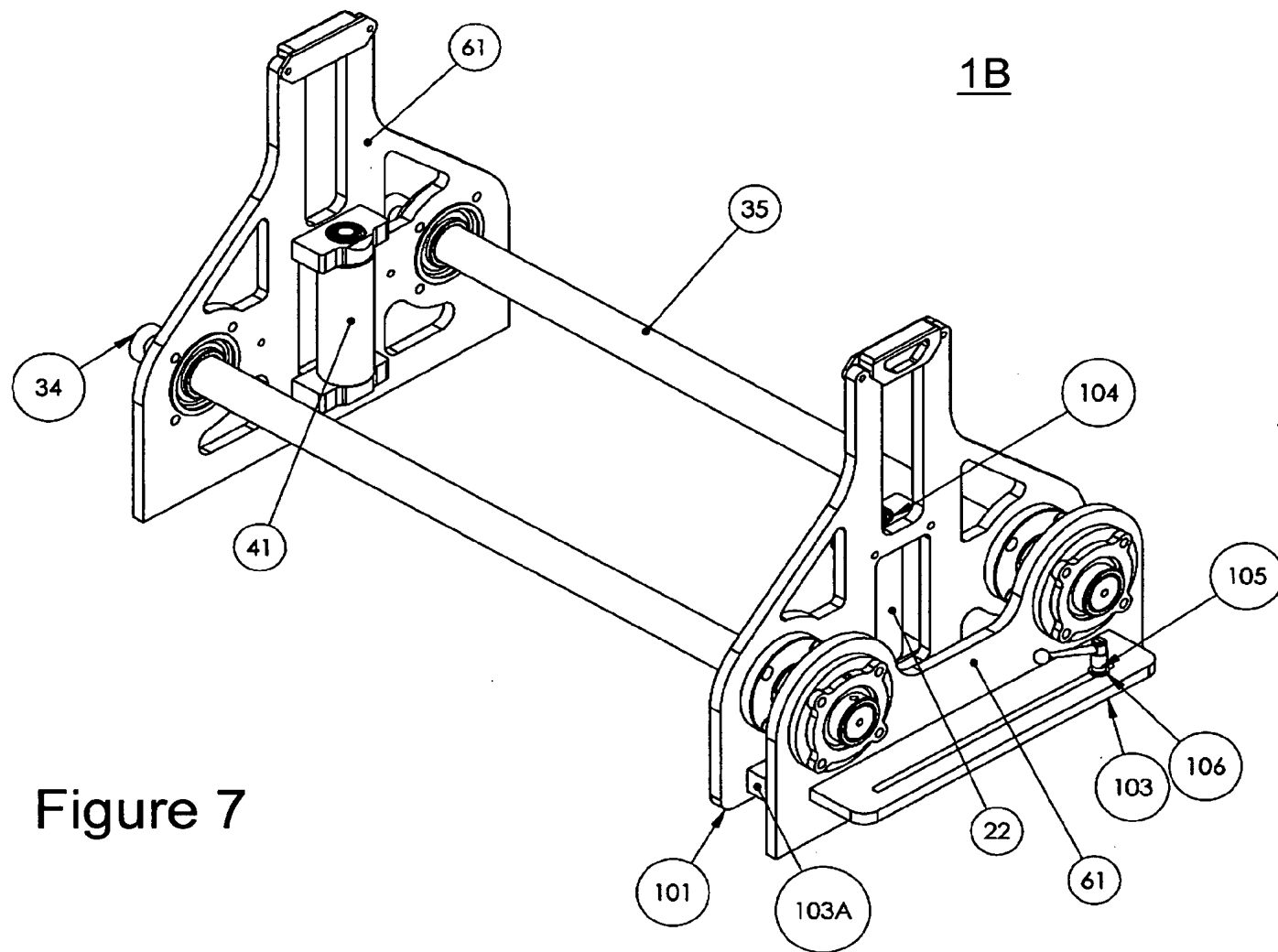


Figure 6B



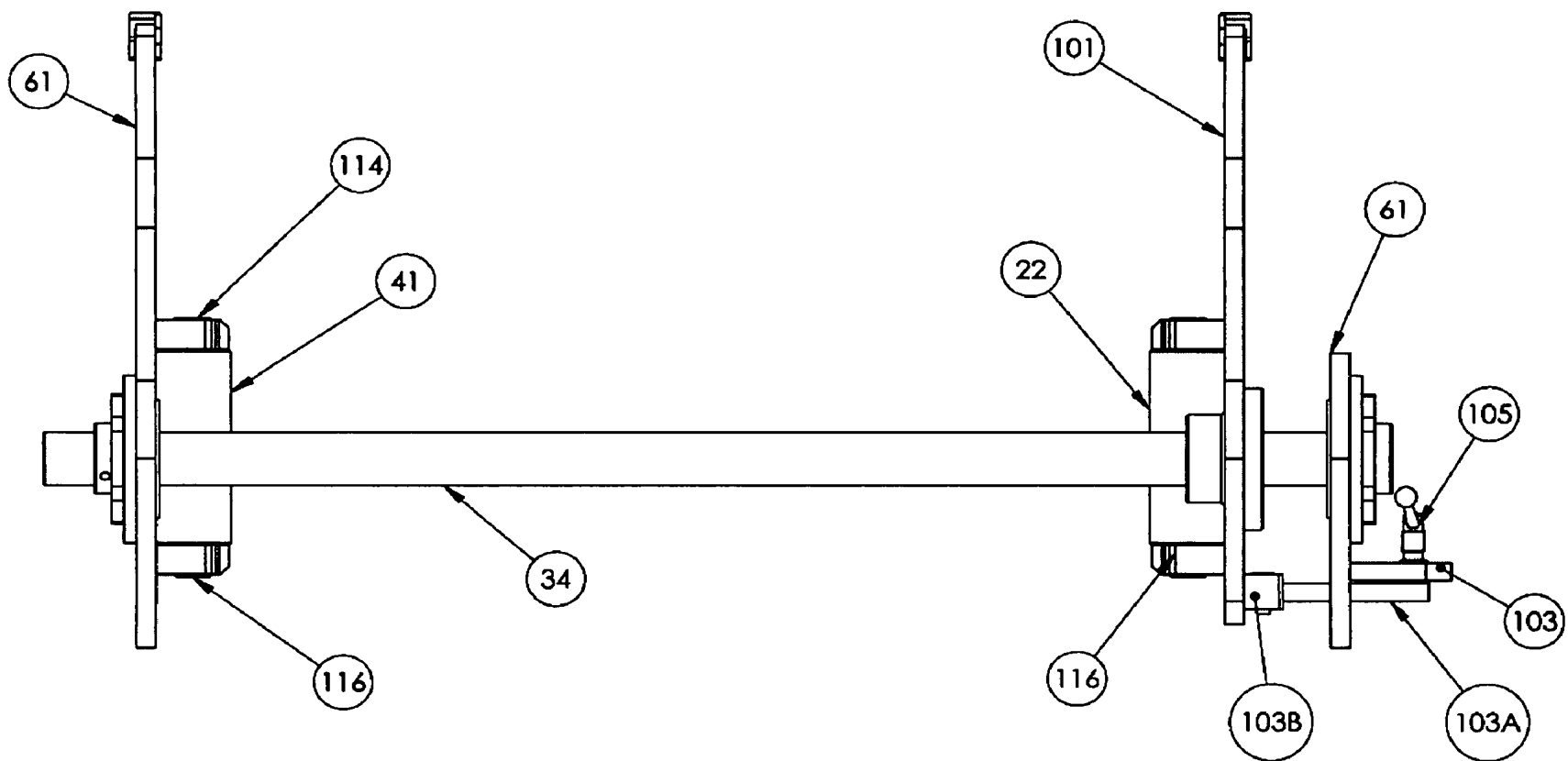


Figure 8

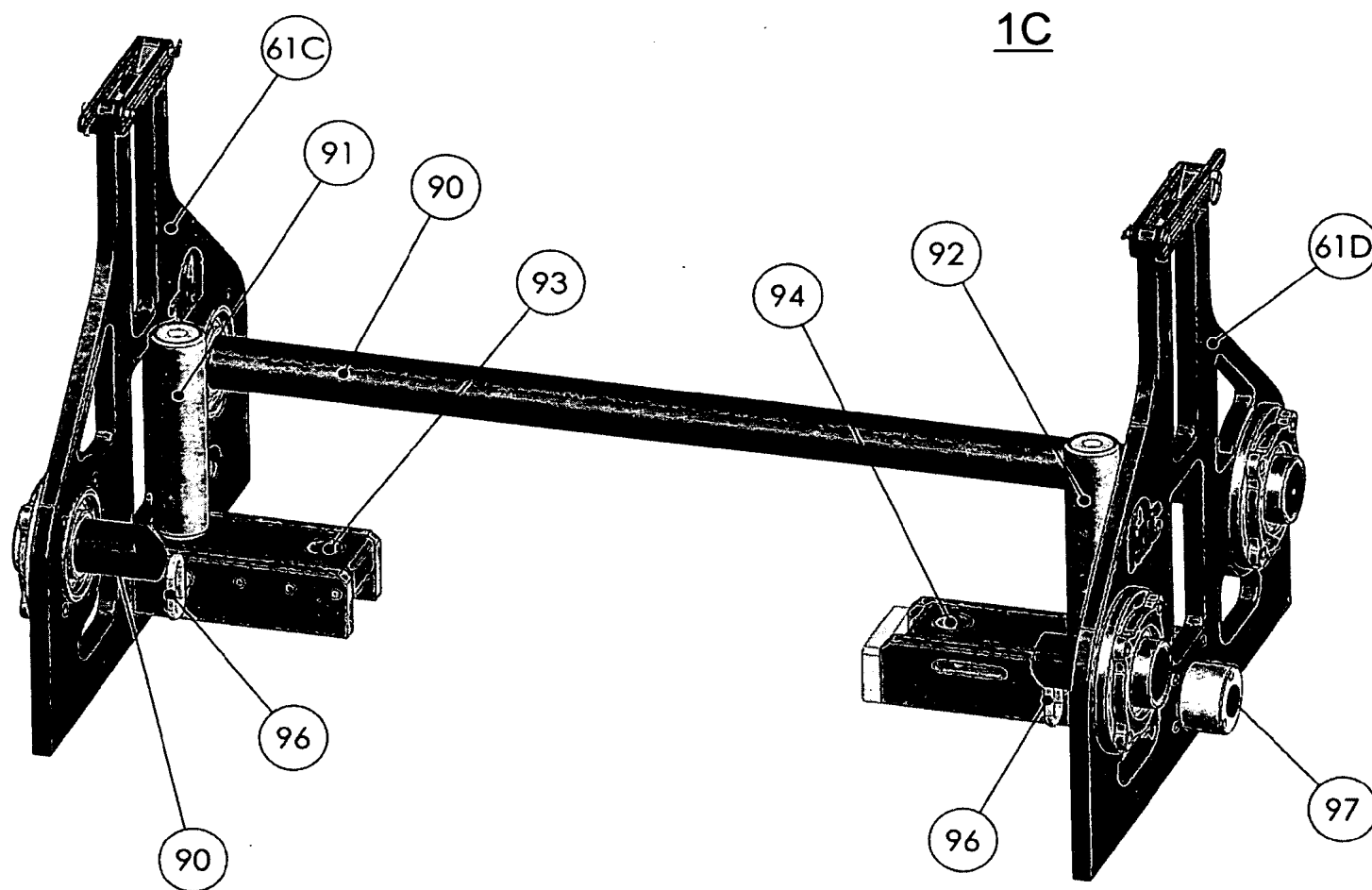


Figure 9

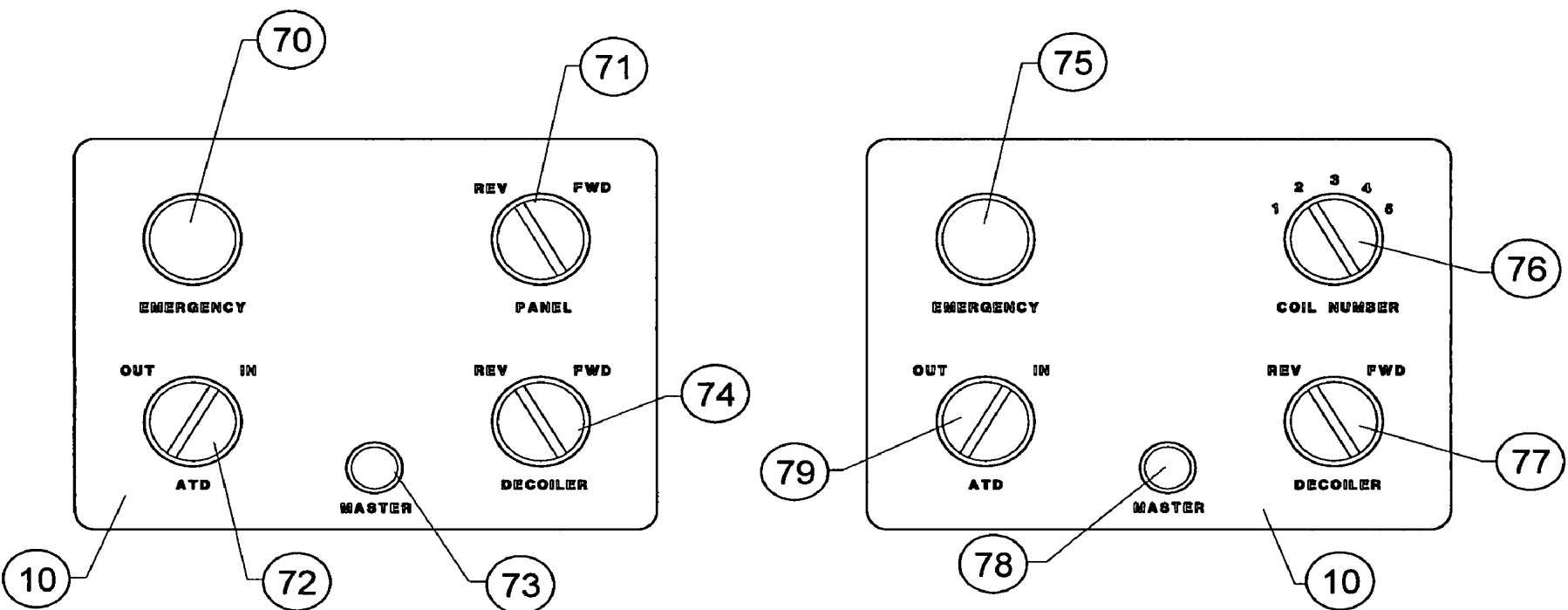


Figure 10

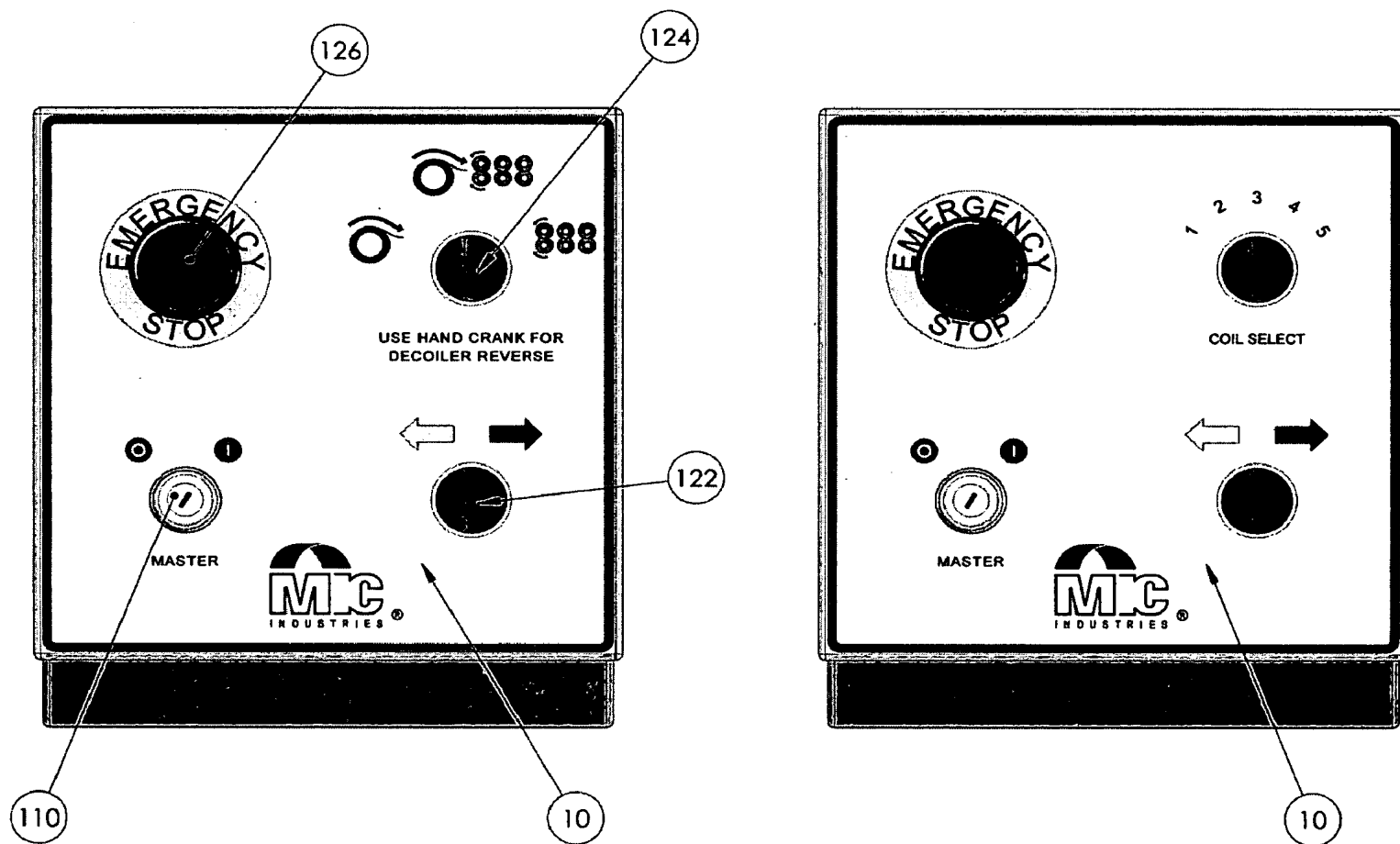


Figure 11

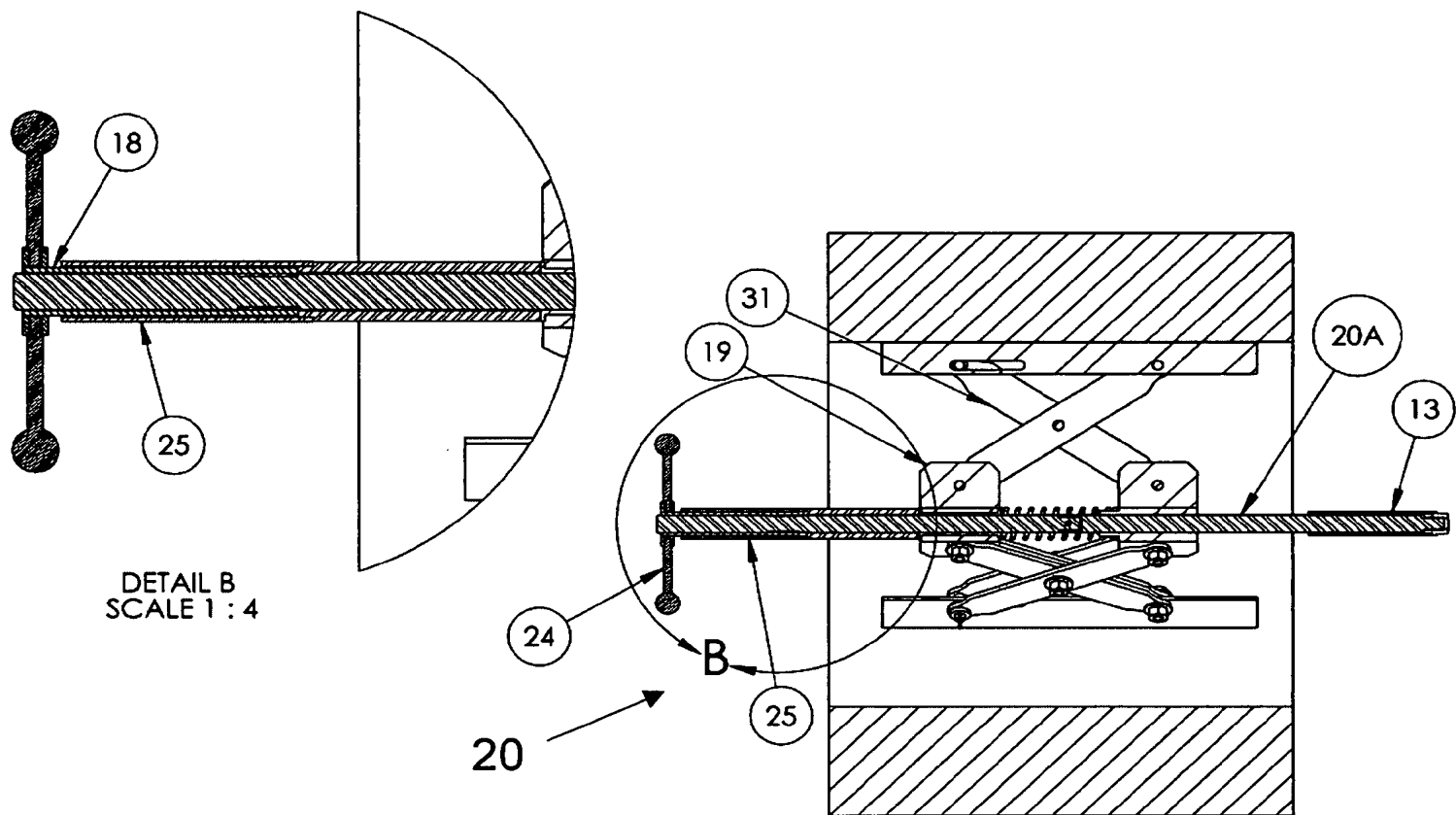


Figure 12

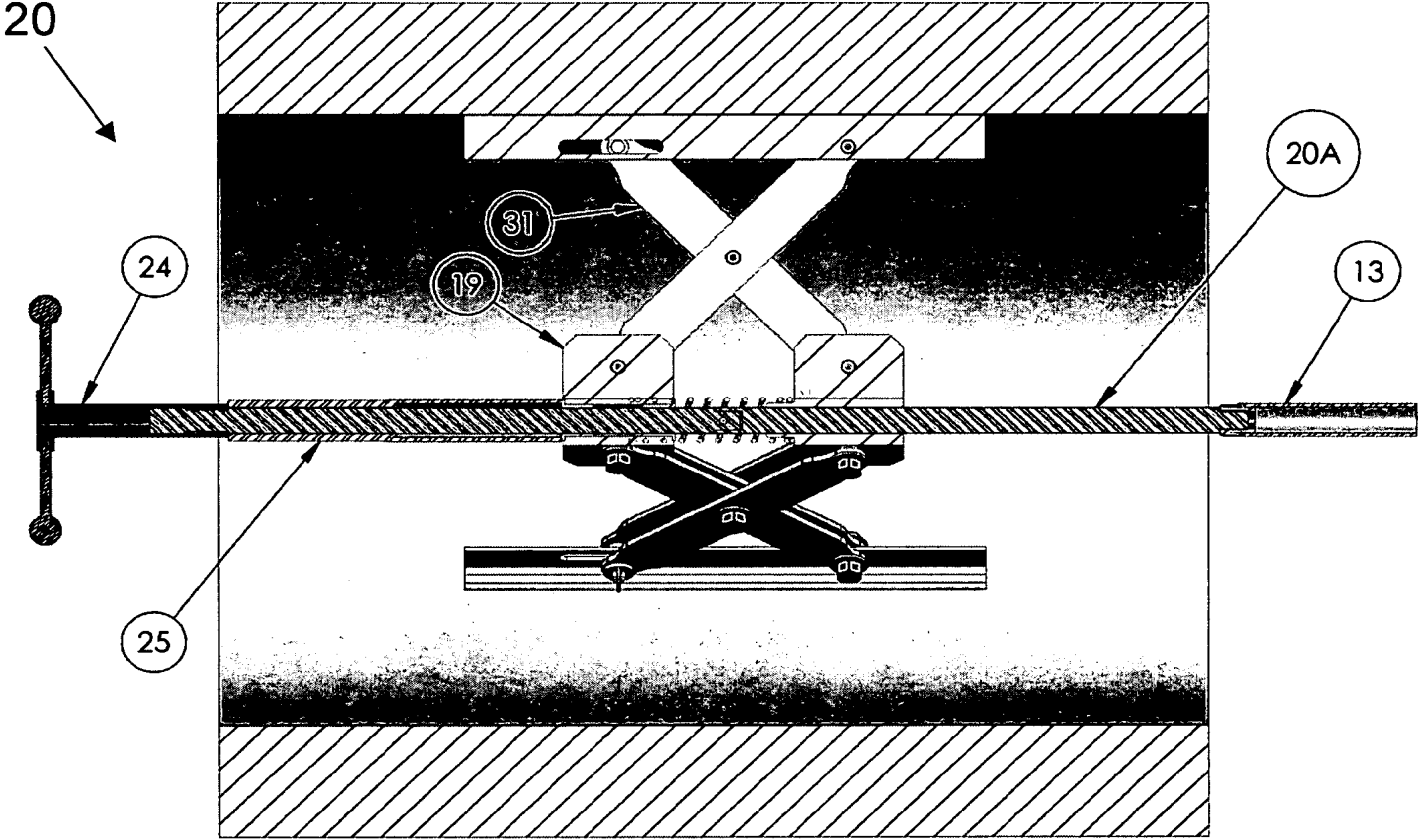


Figure 13

SHEET METAL DECOILING DEVICE AND MULTI-COIL DECOILING SYSTEM

BACKGROUND

[0001] 1. Field of the Invention

[0002] The present disclosure relates to metal building construction, and particularly to providing feed material for metal building construction equipment at a job site. The disclosure more particularly relates to a decoiling device for sheet metal and other feed material for metal building construction.

[0003] 2. Background Information

[0004] In the metal building construction process, it is necessary to provide feed material for the crimping, roll-forming, and fastening operations that comprise metal building construction. Typically the feed material, such as sheet metal of varying gauges, is manufactured, shipped, and stored in large diameter coils. The coiled feed material must be decoiled before it is fed into any apparatus that will perform the aforementioned crimping, roll-forming, and fastening operations. A known example of a decoiling device to decoil a large steel coil for feeding the steel into a roll-forming machine or the like, hereinafter referred to as a forming machine, is an expanding mandrel type decoiling device. In the expanding mandrel decoiling device, a coil of feed material slides over a mandrel that expands to contact the inner diameter of the coil. The coil is supported by the mandrel, which includes a rotating shaft that supports the weight of the coil, so that the coil of material is unrolled or decoiled, and then fed into a roll-forming machine. Other devices such as a drum type decoiler are known, wherein the coiled feed material slides on a drum and is then fed into a roll-forming machine.

[0005] There are significant safety issues presented by the prior art decoiling devices. The most significant dangers result from the nature of the feed material, specifically sheet metal. When the sheet metal is manufactured and rolled into coils, the resilience of the sheet metal can cause the coils to unroll unless the coils are secured. To prevent undesired unrolling, sheet metal coils are generally wound tightly and secured with circumferential strip-metal bands to hold the coil of sheet material in place. When operating any decoiling device, and particularly a conventional expanding mandrel type decoiler, the operator must physically release the coil of steel by releasing the circumferential band or bands. Once such circumferential bands released, the coil can unravel very rapidly, thus creating a potential hazard for anyone nearby.

[0006] Another difficulty in working with coiled sheet metal is commonly called telescoping. Telescoping is the result of inner layers of the coiled material shifting axially slightly off center, so that one end of a layer extends beyond an end of the coil, while the opposite end of that layer recedes inside the coil. The stress produced by a single telescoped layer applies a similar axial displacing force on the adjacent layer, and the effect cascades through the layers producing the telescoping phenomenon. In its most extreme, the steel coil becomes telescoped in a manner such that the axis of the coil is so skewed from the axis of the inner telescoped layers, that the coil is functionally detached from the inner most layers. At this point the skew in the layers of

the coil can render the coil unusable. The operator then must manually straighten the coils out before they can be fed into a roll-forming machine.

[0007] The difficulty of preventing and/or correcting the skewing or telescoping of coils can be exacerbated by stress conditions that the coiled material can acquire during storage. For example, when coiled steel is stored in a location where it is exposed to the elements, ambient temperature variations create stress in the material through thermal expansion and contraction of the material. Furthermore, oxidation can cause variations the thickness of individual layers of coiled sheet metal, thus creating more stress in the coiled sheet metal. These naturally-occurring stresses are naturally relieved by telescoping. In other words, telescoping is a naturally occurring and expected consequence of coiling sheet metal or other resilient sheet building material.

[0008] The present inventors have observed a need for a device that will simultaneously and safely accomplish the tasks of facilitating the safe removal of circumferential bands from coiled feed material and correcting/preventing the problem of coil telescoping, all within the same device as a decoiling mechanism.

SUMMARY

[0009] In order to overcome the above-mentioned shortcomings of the related art, it is an object of the present invention to provide a device for decoiling sheet metal or other building construction sheet feed material. It is a further object of the invention to provide a decoiling device for decoiling sheet material that overcomes the safety hazards associated with conventional decoiling. It is another object of the present invention to provide a decoiling device for decoiling sheet material that permits the safe removal of circumferential bands from the coiled material. It is another object of the present invention to provide a sheet material decoiling device that permits the safe correction of telescoped coils of sheet feed material for varying conditions of previously stored coiled material. It is another object of the present invention to provide a decoiling device configured to enhance safety by preventing a coil of sheet material from becoming unintentionally dislodged from the decoiling device. It is another object of the present invention to provide such advantages via the same decoiling device.

[0010] According to an exemplary embodiment, a decoiling device for decoiling a coil of sheet material is described. The decoiling device (also called a decoiler herein) comprises first and second support rollers on which to support a coil of sheet material. The first and second support rollers (e.g., comprising stainless steel roller surfaces) are oriented such that their rotation axes are parallel to a first direction. The decoiling device also comprises a frame that supports the first and second support rollers, a rotatable mandrel, and first and second guide members. The first and second guide members are positionable at first and second sides of the frame, respectively, so as to limit movement of the coil of sheet material in the first direction.

[0011] In an exemplary aspect, the first and second guide members can comprise first and second guide rollers (e.g., comprising stainless steel roller surfaces), respectively. In addition, each of the first and second guide rollers can be positioned midway between the first and second support rollers, wherein rotation axes of the first and second guide

rollers are oriented in a vertical direction relative to a plane intersecting the rotation axes of the first and second support rollers.

[0012] In another exemplary aspect, the frame can be configured to allow displacement of the rotatable mandrel in a vertical direction relative to a horizontal plane intersecting the rotation axes of the first and second rollers. Also, the frame can be configured to substantially constrain displacement of the rotatable mandrel in a direction perpendicular to the vertical direction. In another exemplary aspect, the frame can comprise a retaining mechanism to prevent the mandrel from exceeding a maximum displacement in the vertical direction. In another exemplary aspect, the rotatable mandrel can be expandable. In another exemplary aspect, the decoiling device can comprise an adjustment mechanism that permits at least one of the first and second guide members to be moved in the first direction.

[0013] According to another exemplary embodiment, multiple decoiling devices can be supported together by a support member to provide a multi-coil decoiling system, which may comprise a mobile platform (e.g., a trailer or a truck) that includes the support member. In such a mobile multi-coil decoiling system, two, three, four, five or more coils could be provided on a single trailer or truck, for example (five coils is advantageous). Of course, any suitable number of decoilers could be used depending upon the weight and size considerations of both the coiled material and the trailer. According to another exemplary aspect, a mobile multi-coil decoiling system can feed sheet material from a given decoiling device into a forming machine, which may be located on a separate but adjacent facility (e.g., an adjacent trailer).

[0014] The exemplary decoiling device can remove and further prevent telescoping of the coil of sheet material by virtue of the guide members, which are preferably guide rollers, and which are positionable at sides of the coil. The guide rollers are positioned to limit movement of the coil in the first direction parallel to the rotation axes of the first and second support rollers. In particular, the guide rollers can be positioned so that both guide rollers contact opposing ends of the coil of sheet material to prevent telescoping. The prevention of telescoping not only avoids mechanical difficulty associated with feeding the sheet material to a forming machine or other apparatus, but also enhances safety to an operator. The location of the guide rollers midway between the first and second support rollers accommodates the diminishing radius of the coil of sheet material without the need for adjustment of the guide rollers during decoiling (because the rotation axes of the guide rollers are always oriented toward the rotation axis of the coil of sheet material regardless of how much sheet material has been decoiled). The exemplary decoiling device can be configured to permit the operator to control the positioning of either or both of the guide rollers either manually or with powered assistance. In a manual operation, the operator can simply rotate a hand wheel crank to position the guide rollers at sides of a coil of sheet material. A power-assisted, semiautomatic operation can be implemented by using electrical and/or hydraulic devices (e.g., motors and/or pistons) to position the guide rollers.

[0015] During normal operation of the exemplary decoiling device, the two support rollers, rather than the rotatable

mandrel, support the weight of the coil of sheet material. The support rollers permit the coil rotate such that sheet material can be fed into a forming machine or other apparatus. The use of two support rollers and a frame configured to allow displacement of the rotatable mandrel in the vertical direction is advantageous because the device can thereby automatically accommodate the diminishing radius of the coil of sheet material as material is removed—as the coil radius becomes smaller, the coil naturally shifts downward in the vertical direction, and the rotatable mandrel shifts downward vertically with the coil.

[0016] The use of two support rollers also provides for straightforward loading of the coil into the decoiling device and straightforward operation of the decoiling device, and provides greater safety than if the weight of the coil were supported only by a rotatable mandrel. For example, the exemplary decoiling device can enhance safety in removing circumferential strip bands from coiled sheet material because the weight of the coil can keep the outer surface of sheet material firmly in contact with the support rollers, thereby preventing the coil from unraveling uncontrollably when the circumferential bands are cut. This configuration provides a very safe operation for the operator.

[0017] The retaining mechanism of the exemplary decoiling device, which prevents the rotatable mandrel from exceeding a maximum displacement in the vertical direction, in combination with the frame configuration that substantially constrains displacement of the rotatable mandrel in a direction perpendicular to the vertical direction, can enhance safety by preventing the coil from escaping the device should there be a malfunction with a forming machine, a mishap in transporting/positioning the decoiler device, or other type of accident. The expandable, rotatable mandrel can expand within the inner diameter of the coil so as to contact firmly the inner surface of the core of the coil. If some occurrence (e.g., stresses within the coil) applies forces that would tend to impel the coil off the decoiling device, or if the coil becomes dislodged from the support rollers, the retaining device can restrain the movement of the rotatable mandrel within certain limits, thereby preventing the coil from becoming dislodged from the decoiling device. This retaining device is designed to handle the weight of the coil.

[0018] According to another aspect, the design of the decoiling device permits the operator to control the rotation of the coil of material so that it feeds into a forming machine or other apparatus, which can all be done with one hand from a location separated from the coil itself, for example, using a remote electrical control that controls decoiler drive motors.

[0019] The design of the exemplary decoiling device can permit safe and continuous operation even before the operator intervenes to correct any of the above-described problems that can occur with the decoiling device. The exemplary decoiling device can be used with building machines, which are known in the art for roll-forming self-supporting steel buildings. When the decoiling device is used with a building machine, such as a roll-forming machine, the decoiling device can provide both control and safety to a single operator while the coiled material is being fed into the building machine.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] FIG. 1 schematically shows a side elevation of an exemplary building machine showing the decoiler installed.

[0021] FIG. 2A is a perspective view of an exemplary mobile multi-coil decoiling system.

[0022] FIG. 2B illustrates side and top views of the mobile multi-coil decoiling system shown in FIG. 2A.

[0023] FIG. 2C is a partial side elevation of the exemplary mobile multi-coil decoiling system shown in FIG. 2A.

[0024] FIG. 3A is a perspective view of an exemplary decoiling device.

[0025] FIG. 3B is a perspective view of another exemplary decoiling device.

[0026] FIG. 4A is a front view of the exemplary decoiling device shown in FIG. 3A.

[0027] FIG. 4B is a front view of the exemplary decoiling device shown in FIG. 3B.

[0028] FIG. 5A is a side view of the exemplary decoiling device shown in FIG. 3A with chain guard and chain removed.

[0029] FIG. 5B is a side view of the exemplary decoiling device shown in FIG. 3B with chain guard and chain removed.

[0030] FIG. 6A illustrates an exemplary anti-telescoping roller subassembly.

[0031] FIG. 6B illustrates another exemplary anti-telescoping roller subassembly.

[0032] FIG. 7 is a perspective view of another exemplary decoiling device.

[0033] FIG. 8 is a partial end view of the exemplary decoiling device shown in FIG. 7.

[0034] FIG. 9 is a perspective view of another exemplary decoiling device.

[0035] FIG. 10 is an illustration of an exemplary control panels for use with exemplary decoiling devices.

[0036] FIG. 11 is an illustration of other exemplary control panels for use with exemplary decoiling devices.

[0037] FIG. 12 is a partial cross-sectional view of an exemplary adjustable, rotatable mandrel arranged in a short configuration.

[0038] FIG. 13 is a partial cross-sectional view of the exemplary adjustable, rotatable mandrel of FIG. 12 arranged in a long configuration.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0039] Reference will now be made in detail of exemplary embodiments of the invention, as illustrated in the accompanying drawings. Whenever possible, similar reference numbers will be used throughout the drawings to refer to the same or like parts.

[0040] FIG. 1 shows a left-side view of an exemplary decoiling device 1 mounted on a support member of a self-contained building machine 2. The decoiling device 1 is

mounted at the front of the trailer that supports the self-contained building machine 2. A coil 3 of sheet material (e.g., steel) is mounted on the decoiler 1 so that sheet material from the coil 3 can be fed into the building machine 2 for a roll-forming operation. An operator can employ the control panel 10 to control the decoiler's electrical and/or hydraulic mechanisms. The decoiling device 1 could be manually operated, instead of electrically or hydraulically operated, if desired, to suit the needs of the customer. The control panel 10 permits the operator one-handed control of the decoiling device 1. Specifically, a single human operator can use one hand to set the coil on the machine, remove any telescoping of the coil, and then feed sheet material from the coil into the forming machine for processing.

[0041] FIG. 2A shows an exemplary embodiment of a mobile multi-coil decoiling system 4. The mobile multi-coil decoiling system 4 is a machine that may be used as an accessory to the self-contained building machine 2. The mobile multi-coil decoiling system 4 is equipped with multiple (e.g., two, three, four, five, etc.) coils, and has the capacity to contain more or less coils, depending on customer and job site requirements. In the example shown, there are five decoiling devices mounted on a support member 4A (e.g., platform) of the trailer. The control box 10 operates these decoilers, and can provide control (e.g., with push buttons and/or other switches) for the operation of all five decoilers by a single human operator. The control box 10 can permit the operator to select any of the decoilers for coils 5-9. Once the operator selects a decoiler, he can then either engage the anti-telescoping feature or start a coil rotation motor, thus feeding sheet material into a self-contained building machine 2 positioned adjacent to the mobile multi-coil decoiling system 4. In an exemplary embodiment, coils 5-9 can feed from the top, allowing, for example, an operator to feed sheet material from one coil (e.g., coil 5) over the tops of the other coils into the self-contained building machine 2 adjacent to the mobile multi-coil decoiling system 4. This feature provides the very desirable feature of eliminating the requirement of constantly loading coils of material. Multiple coils can be loaded on the mobile multi-coil decoiling system 4 for easy access, and, when desired, the operator can simply operate the decoilers one at a time and allow them to feed sheet material into the self-contained building machine 2. Such drive functions could be electric, hydraulic, manual, or any suitable combination thereof, to suit the needs of the customer.

[0042] FIG. 2B shows a side view of the mobile multi-coil decoiling system 4 as well as a top view. As shown in this picture there are a number of coils 5-9 mounted to the mobile multi-coil decoiling system 4, and the number of coils can vary depending on size and weight limitations of the trailer. The trailer can be used to carry multiple coils of sheet material (e.g., steel, aluminum, other sheet metal, etc.), depending on the design; this particular example illustrates five coils. A strap 80 is wrapped around each coil and tied down to the trailer via tie downs 81. This tie-down method is used for all coils to allow safe transport over the road.

[0043] FIG. 2C shows a partial side view of an end of the mobile multi-coil decoiling system 4. This view shows the two rear most coils 8 and 9. A closer view of the strap 80 is shown in this particular view. The strap 80 can be tightened or loosened with a ratchet-type mechanism well known to

those skilled in the art. Of course, any suitable mechanism for securing and tightening the coils 5-9 to the support member 4A could be used (e.g., an over-center device). Tie downs 81 are provided with several holes to allow the hooks from the straps to be inserted. The tie downs 81 can be welded to the trailer frame in a permanent fashion so as to prevent the coils from dislodging from the mobile multi-coil decoiling system 4. The optional electrical control box 10 is also shown.

[0044] FIG. 3A shows a perspective view of the exemplary decoiling device 1. The decoiling device 1 comprises first and second support rollers 34 and 35 on which to support a coil of sheet material. The first and second support rollers 34 and 35 are oriented such that their rotation axes are parallel to one another. The decoiling device 1 also comprises a frame 61 that supports the pair of support rollers 34 and 35. The decoiling device 1 also comprises a rotatable mandrel 20 configured to be inserted into a central opening of the coil of sheet material, and that is also adjustable (i.e., expandable and contractable), as will be discussed further below.

[0045] The first and second support rollers 34 and 35 can each comprise solid metal (e.g., stainless steel) shafts supported at each end by appropriate bearings 34A and 35A mounted to the frame 61. Alternatively, the support rollers 35 and 35 can each comprise a metal (e.g., stainless steel) cylinder that rides on a stationary metal shaft (e.g., stainless or hardened steel) via bearings between the support roller and its stationary metal shaft, wherein the stationary metal shaft can be rigidly attached to the frame 61. Moreover, each of the support rollers can comprise multiple, segmented rolling surfaces (e.g., multiple segmented cylinders) arranged end-to-end along the stationary metal shaft. Other variations will be apparent to those of ordinary skill in the art. As used herein a "roller" is intended to encompass any of various rolling cylinders, wheels, shafts, or other rolling mechanisms, whether segmented or continuous. Materials other than metals can be used for the roller surfaces of the support rollers such as, for example, hard rubber, plastics, polytetra-fluoroethylene (PTFE), and others, as will be appreciated by those of ordinary skill in the art.

[0046] In addition, FIG. 3A shows first and second guide rollers 22 and 41 as examples of first and second guide members, which are supported by the frame 61. The first and second guide rollers 22 and 41 are positioned at opposing sides of the frame 61 midway between the first and second support rollers 34 and 35 such that rotation axes of the first and second anti-telescoping are oriented in the vertical direction. Guide rollers 22 and 41 preferably have stainless steel rolling surfaces that contact the ends of the coil of sheet material. However, materials other than metals can be used for the guide roller surfaces such as, for example, hard rubber, plastics, polytetra-fluoroethylene (PTFE), and others, as will be appreciated by those of ordinary skill in the art. As with the support rollers 34 and 35, any suitable configuration of roller can be used for the guide rollers 22 and 41 (e.g., the roller can comprise solid shaft mounted on a bearing attached to the frame, a cylinder that rides an internal shaft via suitable bearings, etc.). While the use of guide "rollers" is advantageous, other types of guide members can also be used, such as non-rotating steel bars having flat or curved surfaces that are polished to reduce friction or that are treated (e.g., with PTFE) to reduce friction. Also,

while two guide members (e.g., guide rollers) are illustrated in the example of FIG. 3A, it will be appreciated that more than two suitably positioned guide members could be used.

[0047] The coil of sheet material will rest on support rollers 34 and 35. Before the coil is rested, the rotatable mandrel 20 will be inserted into the coil. The rotatable mandrel 20 can comprise multiple (e.g., three) adjustable (expandable/contractable) portions such as, for example, scissor type mechanisms controlled by handle crank 24. The turning motion on the handle crank forces push tube 25 to exert pressure onto the scissor movement tube 19 which rides along a central arbor 20A. This action causes link bars 31 to move in a scissor action. The link bars are directly attached using a bolt and slot action to t-angles 21. Once the rotating force on the handle is applied, the motion will then cause the scissor mechanism to either extend or retract depending on the motion of the handle. The spring 18 is provided to keep pressure on the scissor mechanism to prevent unwanted movement when transporting this metal device from coil to coil and to make the use of the device easier. When the rotatable mandrel 20 is mounted inside the coil and placed on the decoiling device, the ends of the adjustable mandrel 20 protrude through the vertical openings 61A in the frame 61. The frame 61 is configured to substantially constrain displacement of the adjustable mandrel 20 in a direction perpendicular to the vertical direction to prevent the coil from jumping or dislodging from the decoiling device. In this regard, displacement of the adjustable mandrel can be substantially constrained by restricting the available lateral displacement of the mandrel to a distance equal to about four diameters of the central arbor 20A. This can be achieved, for example, by utilizing vertical openings (slots) 61A in the frame 61 that have a width of about four diameters of the central arbor 20A, or less.

[0048] Swing brackets 37 (shown in FIG. 3B, but removed in the view of FIG. 3A) can serve as a retaining mechanism that keeps the rotatable mandrel 20 constrained within a maximum displacement in the vertical direction. If an unexpected force is applied to the coil (e.g., an adjacent roll forming machine applies an unexpected force via the sheet material being fed into the roll forming machine), these swing brackets 37 can prevent the coil from being propelled from the decoiler 1.

[0049] In the example of FIG. 3A, the position of guide roller 41 is fixed relative to the frame 61. The guide rollers in this example comprise cylindrical members that rotate via bearings 42. The guide roller 41 is designed to withstand the side force of the coil as it is inserted into the machine and will limit the movement of the coil in the transverse direction parallel to the rotation axes of the support rollers 34 and 35. A moveable roller assembly comprising roller 22 on the opposite side of the frame 61 is operated by crank handle 67. The turning motion of the crank handle 67 through shaft 66 will cause the guide roller 22 to move inward toward guide roller 41 or outward. By moving the roller 22 toward roller 41, both guide rollers 41 and 22 can be brought into proximity (e.g., contact) with sides of the coil of sheet material to thereby correct and/or prevent telescoping. As described in this disclosure the telescoping of the coils can be a major problem. This guide roller assembly can help reduce the telescoping portions of the coil by applying a physical force to the end of the coils thus pushing the telescoped material back into the main body of the coil. The

rotating shaft **66** attached to the crank handle **67** has a spherical bearing **65** mounted to a stationary bracket **64** and is connected to a lead screw through a pair of bevel gears. The lead screw provides the linear motion for the roller, as will be described later. Although guide roller **41** has been illustrated in this example as a stationary guide roller, it will be appreciated that one or both of the guide rollers **22**, **41** positioned at opposing sides of the decoiling device **1** can be configured as movable guide rollers using an adjustment mechanism as described above.

[0050] As shown in FIG. 3A, the frame **61** can be configured to allow displacement (e.g., 6 inches, 12 inches, 18 inches, 24 inches, etc., or other suitable displacement) of the rotatable mandrel **20** in a vertical direction relative to a plane (i.e., a mathematical plane) that intersects the rotation axes of the first and second rollers by allowing the mandrel to move vertically in the slots **61A** in the frame **61**. It will be observed that the slots **61A** in the frame **61** substantially constrain displacement of the mandrel **20** in a direction perpendicular to the vertical direction because the mandrel **20** can only move in the horizontal direction by an amount corresponding to the width of the slots **61A**. The frame **61** can also be configured to prevent the mandrel **20** from exceeding a maximum displacement in the vertical direction by virtue of a retaining mechanism (e.g., swing brackets **37** shown in FIG. 3B, but removed in the view of FIG. 3A) configured with the frame. While the example of FIG. 3A illustrates using slots **61A** in frame **61** to substantially constrain the motion of the mandrel **20** in the horizontal direction, other approaches will be apparent to those skilled in the art. For example, vertical posts could be mounted at each side of the frame as a substitute for slots, and the shaft of the mandrel could be configured with collars at each end so as to slide up and down over the vertical posts. In such an arrangement, removable collars with an appropriate retaining mechanism (e.g., locking pins or set screws) could be attached at the top or elsewhere on the vertical posts to provide a suitable retaining mechanism to constrain the vertical motion of the mandrel.

[0051] FIG. 4A shows an end view of the decoiling device **1** illustrated in FIG. 3A. This view shows movable guide roller **22** in the outward position before it contacts the coil. The outward position is used for loading and unloading coils. Stationary guide roller **41** is rotatably mounted to bearing **42** on the stationary side. In this view the coil stock is pushed directly against the stationary roller. The crank handle **67** when turned will cause movable guide roller **22** to move inward to remove and prevent any telescoping of the coil by contacting the coil of sheet material as it rotates within the decoiling device.

[0052] FIG. 5A shows a side view of the decoiler **1** illustrated in FIG. 3A and illustrates a motor **51** (e.g., a hydraulic or electric motor) which is attached to sprocket **33**. The sprocket **33** is configured to drive a sprocket **33A** on the support roller nearest the motor **51** with a chain (not shown). The support roller nearest the motor **51** can include two such sprockets near the end of a drive shaft of the support roller, one of which is driven by a chain connected to sprocket **33**, and the other of which drives another sprocket **33B** attached to the other support roller via another chain (not shown). Of course other types of drive mechanisms other than a chain drive, such as a belt drive or a gear drive with a rotating drive shaft, could be used to drive the support rollers. Thus, when

hydraulic motion is applied to motor **51**, the motor turns and drives the support rollers via sprockets **33A**, **33B** and **33C**, thereby causing the coil to spin in a desired direction (either clockwise or counterclockwise). The configuration of this example allows easy, one-handed operation of feeding sheet material from the coil into a roll-forming machine using the controller **10**, which controls the motor **51**. The use of the motor **51** is very beneficial for this purpose.

[0053] In addition, one or both of the support rollers can be configured with manual drive portion **90** (shown in FIG. 4A), such as a bolt head that is directly mounted to an end of one of the support rollers that can be turned with a wrench, or such as a suitably shaped slot that can be driven with an insertable handle driver. Thus, using a wrench or a handle, a support roller can be turned, thereby turning the coil, without the aid of a motor. This feature can be beneficial should some type of adjustment be necessary or should there be a loss of power, for example. Of course, a tangential force imparted to the coil of sheet material by the pulling of the sheet material itself can cause rotation of the coil (e.g., wherein a drive mechanism of an adjacent roll forming machine pulls on the sheet material).

[0054] FIG. 3B illustrates another exemplary decoiling device **1A** having an alternate mechanism for adjusting the movable guide roller **22**. Decoiling device **1A** is similar to decoiling device **1** of FIG. 3A in many respects. In this example, instead of having a crank handle disposed at the front of the decoiler (such as shown in the FIG. 3A example), an adjustment mechanism for moving the movable guide roller **22** is arranged at the side of the decoiling device **1A**. In particular, for example, an insertable crank handle **67** can be inserted into a slot **63A** to drive the guide roller inward toward the opposing guide roller **41** or outward therefrom. Collar **63** is used to support the handle **67** as it is turned clockwise or counterclockwise. The roller **22** will move transversely (axially) towards roller **41** to tighten the coil. While a slot **63A** and an insertable handle **67** are shown in this example (e.g., with the slot and handle end being square-shaped to provide a square drive), any suitable drive mechanism can be used to drive the movable guide roller **22**.

[0055] Also shown in the example of FIG. 3B is an additional safety device **72** that can further prevent the coil from dislodging from the decoiler and which can further stabilize the coil during normal operation. The safety device **72** comprises a main plate with glide plate material mounted thereon and also comprises a roller **71** made of, for example, a plastic type material or any type of non-scratching material (e.g., hard rubber, PTFE, etc.) to provide the additional safety and stabilization functions without damaging the sheet material. It will be appreciated that a coil may tend to dislodge from a decoiler when a small amount of sheet material is left on the decoiler, because the small amount of sheet material can tend to spring open since the weight of the coil may no longer be sufficient to hold the sheet material firmly against the support rollers. The safety device **72** can stop the coil from springing and exiting the decoiler mechanism.

[0056] FIG. 4B illustrates an end view of the exemplary decoiler **1A** shown in FIG. 3B. Handle **67** is shown in the removed position. When inserted into the proper position and turned clockwise or counterclockwise, guide roller **22** will move transversely towards the coil and will push the

coil against guide roller **41** to provide contact to thereby remove/prevent telescoping of the coil.

[0057] FIG. 5B shows a further perspective view of the exemplary decoiler **1A** of FIG. 3B with a coil of sheet material mounted on the decoiler **1A**. As illustrated in FIG. 5B, the slot **61A** in frame **61** and the associated swing bracket are configured to limit displacement of the coil in the horizontal direction, and the safety mechanism **72** can further prevent unwanted dislodging of the coil from the decoiler **1A**.

[0058] Also shown in FIG. 5B is the motor **51** (e.g., a hydraulic or electric motor) which is attached to sprocket **33**, which can drive the sprocket **33A** attached to the nearest support roller via a chain (not shown). Sprocket **33C**, also attached to this support roller, can drive sprocket **33B** attached to the other support roller via a chain (not shown). According to a further exemplary aspect, sprocket **33A** can be mounted to the shaft of the nearest support roller via a clutch mechanism **69** (e.g., a cam clutch) disposed between the roller shaft and the sprocket **33A**. This configuration allows full automatic feed of sheet material from the decoiler into an adjacent panel forming machine or other forming apparatus (not shown). In normal operation, for example, the panel forming machine or other apparatus could run faster at times than the decoiler **1A**. In such instances, the cam clutch **69** can allow disengagement of the sprocket **33A** during operation and allow the support rollers to roll freely, thereby allowing the coil of sheet material to decoil at a rate governed by the panel forming machine or other apparatus into which the sheet material is being fed. When the weight of the coil of sheet material is diminished to the point where the weight of the sheet material would not provide enough friction against the support rollers to keep the support rollers turning at the rate governed by the panel forming machine or other apparatus, the support rollers would then slow, thereby allowing cam clutch **69** to engage such that the hydraulic motor **51** would turn the support rollers. Thus, the support rollers would turn at all times, albeit at potentially different rates depending on the weight of the coil of sheet material. This aspect can allow seamless operation of the decoiling device **1A** in conjunction with a panel forming machine or other apparatus into which the sheet material is being fed.

[0059] FIG. 6A illustrates a partial three dimensional view of an exemplary movable guide roller subassembly suitable for use with the exemplary decoiling device of FIG. 3A. Moveable guide roller **22** is shown in a phantom type view and can be seen rotatably mounted to shaft **49** via bearings **48** and **50**. Bearings **48** and **50** are used to provide a low friction mechanism so that the roller **22** will spin more freely. A washer cap **47** keeps the roller **22** constrained to the shaft **49**. Moveable block **43** slides via the grooves in the end blocks **44** and **45**. As rotation is applied from shaft **66** (see FIG. 3A) from the crank handle **67**, a drive gear **56A** attached to block **56** provides rotating force to motor gear **60**. The turning motion of this motor gear **60** is applied to shaft **52**. Shaft **52** includes a partial acme type thread which applies screw motion to sliding block **43**. This linear motion will allow sliding block **43** to move back and forth between blocks **44** and **45**. Thus, movable guide roller **22** can be positioned to contact the side of the coil to thereby provide an anti-telescoping function for the decoiling device **1A**. It will be appreciated that one or both of the guide rollers

positioned at opposing sides of the decoiling device can be configured as movable guide rollers using such an adjustment mechanism.

[0060] FIG. 6B illustrates a partial three dimensional view of an exemplary movable guide roller subassembly suitable for use with the exemplary decoiling device of FIG. 3B. The subassembly shown in FIG. 3B has a different type of adjusting mechanism with one common shaft **52**, which is a threaded device and which moves slide block **43** relative to end blocks (receivers) **44** and **45** similar to the other type of device which was explained previously. In FIG. 6B, shaft **52** is shown as terminated at a surface of the subassembly, but actually would extend a sufficient distance so as to mate with collar **63** shown in FIG. 3B and would include a slot or other drive connection adapted to accommodate the handle **67** shown in FIG. 3B. It will be appreciated that one or both of the guide rollers positioned at opposing sides of the decoiling device can be configured as movable guide rollers using such an adjustment mechanism.

[0061] FIG. 7 illustrates a perspective view another exemplary decoiling device **1B**, e.g., for the mobile multi-coil decoiling system **4**, and FIG. 8 shows an end view of the decoiling device **1B**. The decoiling device **1B** is similar to devices **1** and **1A** of FIGS. 3A and 3B in many respects. Two support rollers **34** and **35** (e.g., solid metal shafts riding on bearings mounted to frame **61**) are used to support the weight of the coil. Moreover, the decoiling device **1B** includes a sliding plate **101** with a guide roller **22** attached thereto, wherein the position of the sliding plate is adjustable to accommodate coils of different widths. The mobile multi-coil decoiling system **4** shown in figures herein can carry multiple width coil stock on a trailer, and such multiple widths can typically range from 18 inches to 40 inches. Of course, the coil dimensions are not limited to these exemplary widths, and any suitable coil dimensions can be accommodated with different sizes of decoilers.

[0062] A locking handle **105** (friction mechanism) is used to release main sliding plate **101**, which is connected to a slotted friction plate **103** via a movable bar **103A**. The movable bar **103A** extends through a slot in frame **61** and is connected to main sliding plate **101** via a hinge connection **103B**. When the locking handle is turned $\frac{1}{4}$ turn, for example, frictional force from friction washer **106** is released from the friction plate **103**. This allows sliding plate **101** to move transversely within the decoiler **1B** along support rollers **34** and **35**. As the sliding plate **101** moves inward, for example, the movable bar **103A** swings at hinge **103B**, and the locking handle **105** connected to an end of the movable bar **103A** slides toward support roller **34**. When the desired position of the sliding plate **101** is achieved such that the guide rollers **22** and **41** contact the coil, the locking handle **105** is then tightened. Friction washer **106** will apply frictional force between friction plate **103** and movable bar **103A** and will maintain the position of main sliding plate **101**. This adjustment mechanism allows the guide rollers **22** and **41** to contact the coil and apply pressure on the coil so as to prevent the coil from moving transversely and can thereby correct and/or prevent telescoping of the sheet material. An adjustable mandrel **20** such as previously described in this disclosure is also used with the exemplary decoiler **1B** to prevent unwanted dislodging of the coil from the decoiling device.

[0063] As shown in FIG. 8, it can be seen that guide rollers 22 and 41 can be positioned to contact the coil of sheet material. These guide rollers can be mounted to the frame 61 and the main sliding plate 101 via suitable bearings 114 and 116 and suitable mounting brackets and hardware.

[0064] FIG. 9 shows another exemplary decoiling device 1C that can be used with a multi-coil decoiling system 4. Decoiler 1C utilizes two main side plates 61C and 61D of frame 61. Structural members that connect side plates 61C and 61D together are not shown to avoid obscuring the drawing. An aspect of this design is that guide rollers 91 and 92 can be removed from their present slots and inserted in the two respective slots 93 and 94 to make large adjustments in the positions of the guide rollers 91 and 92. Guide rollers 91 and 92 are held in place with pins 96. If a pin 96 is removed, the guide roller can be lifted straight up and inserted into an adjacent slot. This feature allows different size coils (e.g., wide coils or narrow coils) to be inserted into the decoiling device 1C. To provide further adjustment there is a crank mechanism 97, such as described previously herein, at the right side that allows crank handle (not shown) to drive an adjustment mechanism, such as previously described herein, to provide fine adjustment of roller 92 to accommodate different coil widths. For example, fine adjustment of 1, 2, 3, 4, 5 or more inches of displacement could be provided with such an adjustment mechanism. This design can be advantageous in that it requires relatively little material, provides an inexpensive design, and allows for an easy method adjustment.

[0065] FIG. 10 shows a partial front view of exemplary control panels 10 that can be used for both a given decoiling device and a mobile multi-coil decoiling system 4. As noted previously herein, hydraulic, electric, and/or manual drive mechanisms can be utilized with the decoilers to provide the desired decoiling motion. Control panels 10 for an electric or hydraulic version are shown with master switches 73, 78 to activate the controls. Anti-telescoping switches 72, 79 (either in or out) can control the positions of guide rollers, and a feed mechanism switch 71 can control a hydraulic or electric motor 51 to cause the decoiler to operate in forward or reverse. The disclosure is not limited to a certain type of control; FIG. 10 illustrates exemplary control devices that can be used. Control panel 10 at the right of FIG. 10 is a typical control panel for the mobile multi-coil decoiling system 4, wherein the user would simply select the coil number with switch 76. The reverse and forward control 74, 77 can be used to operate the hydraulic or electric motor to run in either forward or reverse. A master switch 73, 78 and an emergency stop 70, 75 allow the power to be deactivated. Other exemplary control configurations will be apparent to those skilled in the art.

[0066] FIG. 11 shows additional exemplary designs of optional electrical control panels. Switch 122 allows operation of the decoiler in forward and reverse. A panel-former-only option can be used by turning switch 124 fully to the right position which allows controlling the forward and reverse motion of a panel former of the building machine 2 without controlling a decoiling device. A center position of switch 124 can allow the decoiler to be driven automatically in conjunction with the panel former machine. In this position the operator needs to do nothing but start the panel former (e.g., with a remote control device), and the decoiler can run at the same speed utilizing the cam clutch mechanism as explained before, thereby allowing full automatic operation of the decoiler. The master switch 110 is used for turning the unit on. Emergency stop 126 is used stop all devices in case of emergencies.

[0067] FIGS. 12 and 13 illustrate an exemplary rotatable mandrel 20 whose inner arbor 20A is configurable in two lengths of the arbor 20A, one for wide coils and one for short coils. The selectable lengths of the arbor 20A can be whatever dimensions are suitable for the size of coils being used, e.g., such as 24 inches for short coils and 36 inches for wider coils. It will be appreciated that there are no limits to the standard dimensions of the coils. The dimensions of the arbor 20A components can be designed so that the arbor 20A can change length to provide custom short and long dimensions.

[0068] FIG. 12 shows a partial cross-sectional view of the exemplary rotatable mandrel 20 with the arbor 20A in a "short arbor" configuration. The exemplary mandrel 20 comprises a scissor mechanism such as previously described herein that permits the mandrel 20 to expand or contract so as to contact or recede from the inner coil surface at the opening of a coil of sheet material. As illustrated, crank handle 24 is nested within a push tube 25. Also a stabilizer tube 13 on the right side is shown in its short nested position. A very simple method to change the configuration to a "long arbor" configuration is illustrated in FIG. 13. FIG. 13 shows a partial cross section of the arbor 20A and coil of sheet material. As illustrated, crank handle 24 pushes against push tube 25. Also, stabilizer tube 13 is reversed 180 degrees compared to its position in FIG. 12. A conversion between the short and long arbors only requires the reversal of 180 degrees of the both the stabilizer tube 13 and the push tube 25. The crank handle 24 will either nest within the push tube 25 in the short configuration or push against the push tube 25 in the long configuration. In a similar manner, the stabilizer tube 13 will either extend the arbor shaft or nest over the outer portion of the arbor shaft. In either case the push tube can push the link carrier 19 thus moving link arms 31 and expanding the mandrel 20 to the contact the inner diameter of the coil. The expansion of the mandrel 20 is accomplished through rotation of the crank handle 24 as described previously herein. This feature is convenient because it allows the user to use one adjustable, rotatable mandrel device for a variety of coils of different inner diameters.

[0069] While this invention has been particularly described and illustrated with reference to exemplary embodiments thereof, it will be understood by those skilled in the art that changes in the above description or illustrations may be made with respect to form or detail without departing from the spirit or scope of the invention.

What is claimed is:

1. A device for decoiling a coil of sheet material, comprising:

first and second support rollers on which to support a coil of sheet material, the first and second support rollers being oriented such that their rotation axes are parallel to a first direction;

a frame that supports the first and second support rollers;

a rotatable mandrel; and

first and second guide members positionable at first and second sides of the frame, respectively, so as to limit movement of the coil of sheet material in the first direction.

2. The device according to claim 1, wherein the first and second guide members comprise first and second guide rollers, respectively.

3. The device according to claim 2, wherein each of the first and second guide rollers is positioned midway between the first and second support rollers, and wherein rotation axes of the first and second guide rollers are oriented in a vertical direction relative to a plane intersecting the rotation axes of the first and second support rollers.

4. The device of claim 1, wherein the frame is configured to allow displacement of the rotatable mandrel in a vertical direction relative to a plane intersecting the rotation axes of the first and second support rollers.

5. The device of claim 4, wherein the frame is configured to substantially constrain displacement of the rotatable mandrel in a direction perpendicular to the vertical direction.

6. The device of claim 4, wherein the frame comprises a retaining mechanism to prevent the rotatable mandrel from exceeding a maximum displacement in the vertical direction.

7. The device of claim 1, wherein the rotatable mandrel is expandable.

8. The device of claim 1, comprising an adjustment mechanism that permits at least one of the first and second guide members to be moved in the first direction.

9. The device of claim 1, wherein the rotatable mandrel comprises an arbor whose length is adjustable.

10. The device of claim 1, further comprising a motor configured to drive the first support roller via a drive mechanism coupled to the first support roller, wherein the drive mechanism includes a clutch mechanism.

11. A system for decoiling multiple coils of sheet material, comprising:

multiple decoiling devices; and

a support member that supports the multiple decoiling devices,

wherein each decoiling device comprises:

first and second support rollers on which to support a coil of sheet material, the first and second support rollers being oriented such that their rotation axes are parallel to a first direction;

a frame that supports the first and second support rollers;

a rotatable mandrel; and

first and second guide members positionable at first and second sides of the frame, respectively, so as to limit movement of the coil of sheet material in the first direction.

12. The system of claim 11, comprising a mobile platform configured to be transportable from one location to another, wherein the mobile platform includes the support member.

13. The system of claim 12, wherein the mobile platform comprises a trailer or a truck.

14. The system according to claim 11, wherein the first and second guide members comprise first and second guide rollers, respectively.

15. The system according to claim 14, wherein each of the first and second guide rollers is positioned midway between the first and second support rollers, and wherein rotation axes of the first and second guide rollers are oriented in a vertical direction relative to a plane intersecting the rotation axes of the first and second support rollers.

16. The system of claim 11, wherein the frame is configured to allow displacement of the rotatable mandrel in a vertical direction relative to a plane intersecting the rotation axes of the first and second support rollers.

17. The device of claim 16, wherein the frame is configured to substantially constrain displacement of the rotatable mandrel in a direction perpendicular to the vertical direction.

18. The system of claim 16, wherein the frame comprises a retaining mechanism to prevent the rotatable mandrel from exceeding a maximum displacement in the vertical direction.

19. The system of claim 11, wherein the rotatable mandrel is expandable.

20. The system of claim 11, comprising an adjustment mechanism that permits at least one of the first and second guide members to be moved in the first direction.

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(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2007/0210202 A1****Miller**(43) **Pub. Date: Sep. 13, 2007**(54) **APPARATUS FOR LIFTING AND SUPPORTING FENCE ROLLS**(76) Inventor: **Olen O. Miller**, Sugarcreek, OH (US)

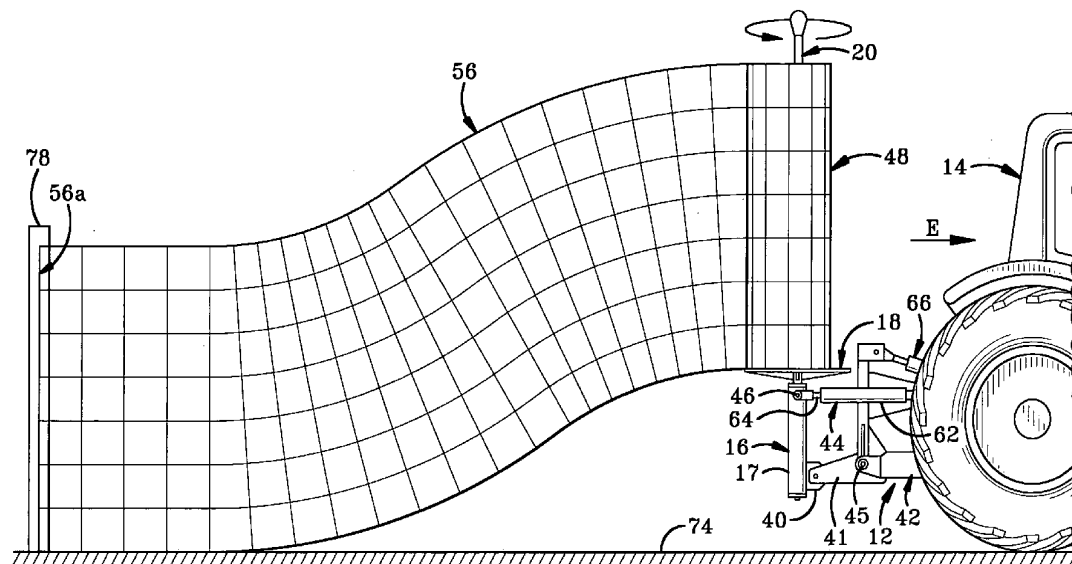
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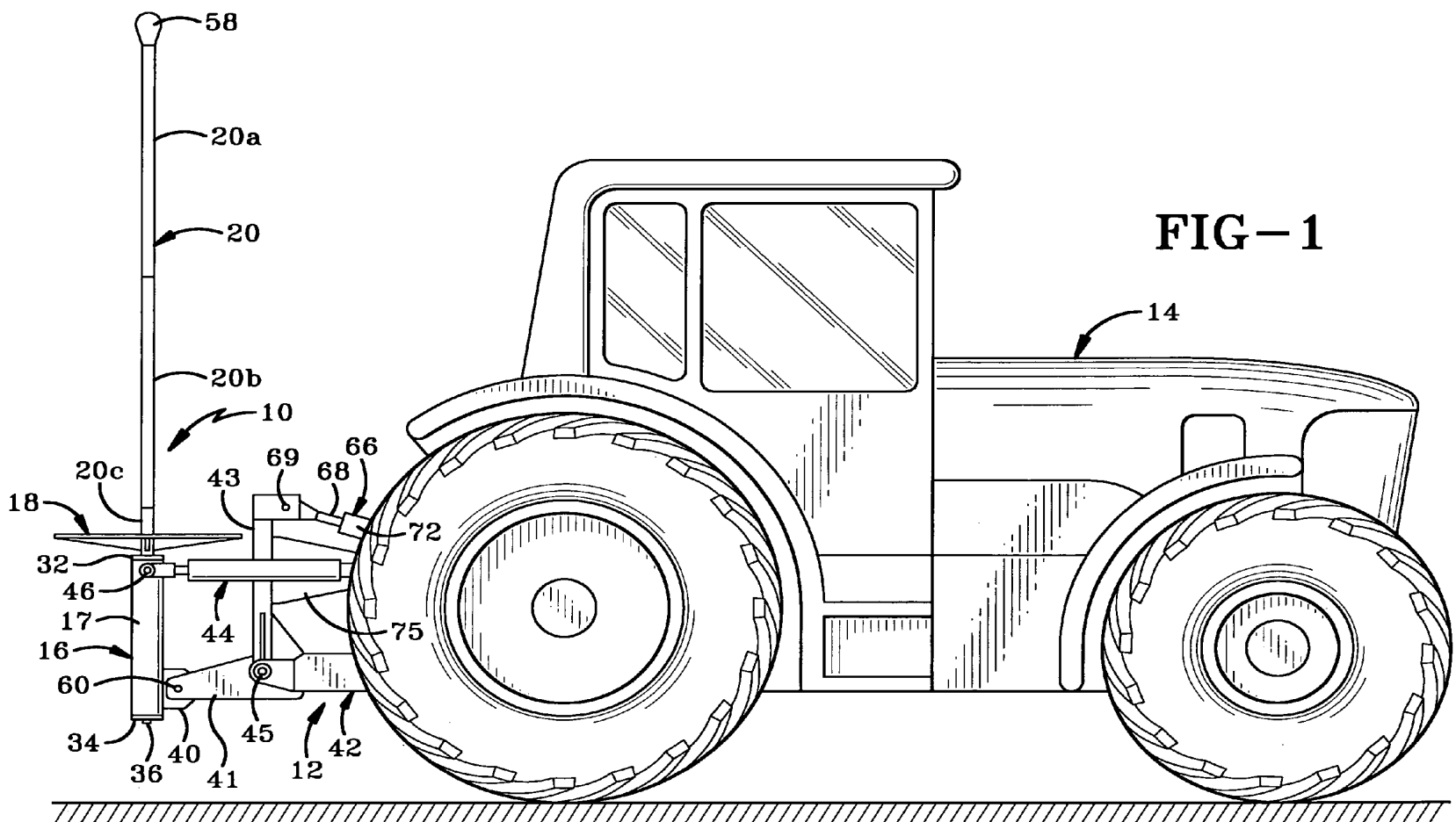
SAND & SEBOLT**AEGIS TOWER, SUITE 1100, 4940 MUNSON STREET, NW
CANTON, OH 44718-3615**(21) Appl. No.: **11/713,909**(22) Filed: **Mar. 5, 2007****Related U.S. Application Data**

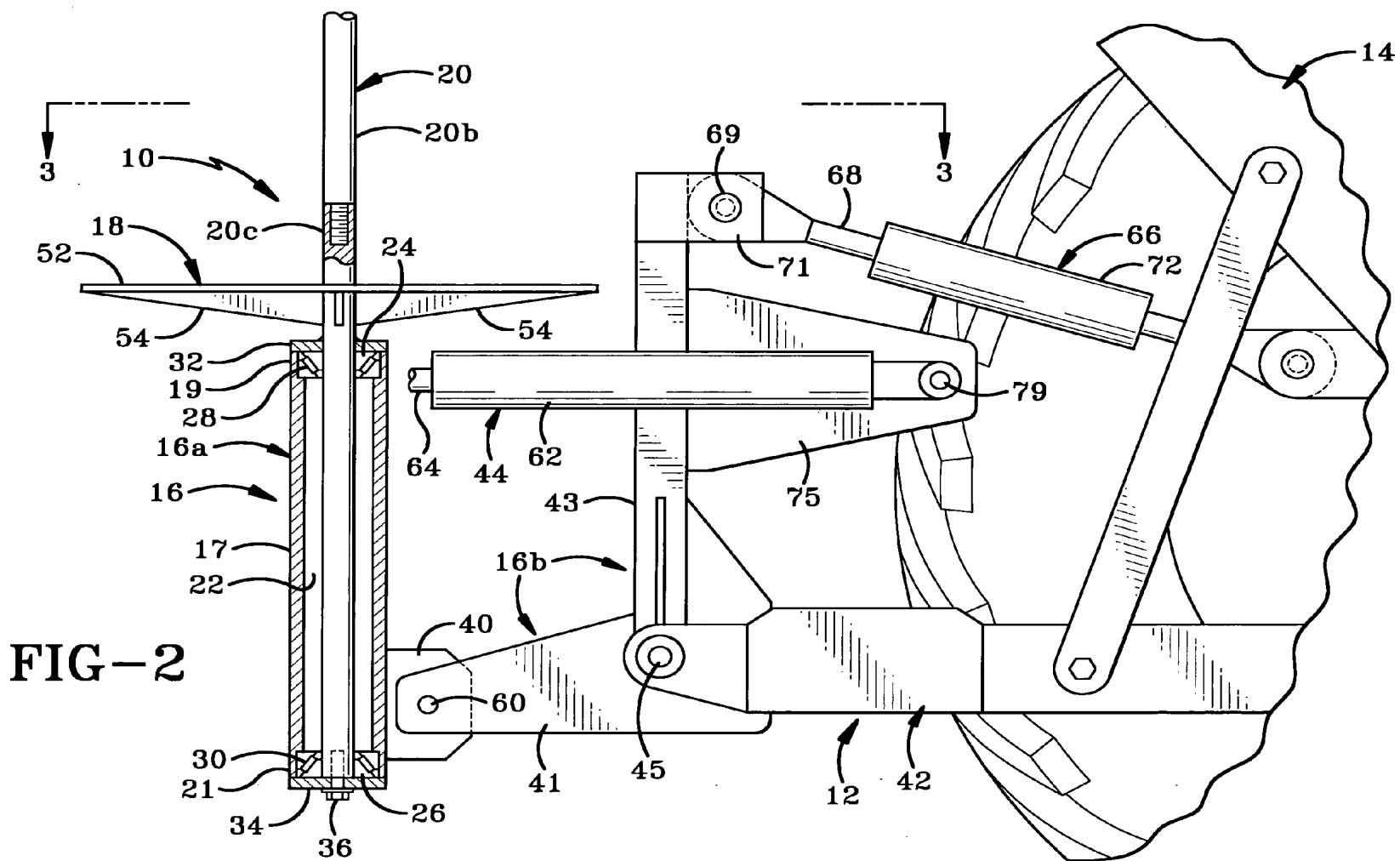
(60) Provisional application No. 60/781,270, filed on Mar. 10, 2006.

Publication Classification(51) **Int. Cl.****B65H 16/04** (2006.01)**B65H 19/12** (2006.01)(52) **U.S. Cl.** **242/557; 242/597.7; 242/597.8**(57) **ABSTRACT**

An apparatus for lifting and supporting a roll of wire fencing during installation of a wire fence. The apparatus is attachable to a standard three-point hitch mounted on a vehicle such as a tractor. The apparatus comprises a base which is pivotally connected to the hitch and a post that extends outwardly from the base and is insertable into an axial bore in the roll of fencing. The apparatus further includes a platform mounted at right angles to the post. The three-point hitch is activated to move the apparatus between a first position, where the post is oriented vertically, and a second position where the post is oriented horizontally. The apparatus is maintained in the first position when not in use. When the hitch is activated, the apparatus is moved into the second position, the vehicle is driven toward the roll of fencing to insert the post into the bore of the roll. The hitch is again activated to rotate the apparatus back into the first position. This movement causes the post to lift the roll of wire fencing off the ground. When the post is again in the first position, the end of the roll is supported on the platform. A first end of the wire fencing is secured to a fence post and the vehicle is driven forward to unroll a section of wire fencing from the roll. When the fencing operation is completed, the hitch is activated to move the apparatus from the first position back to the second position so that the roll of fencing may be removed therefrom.







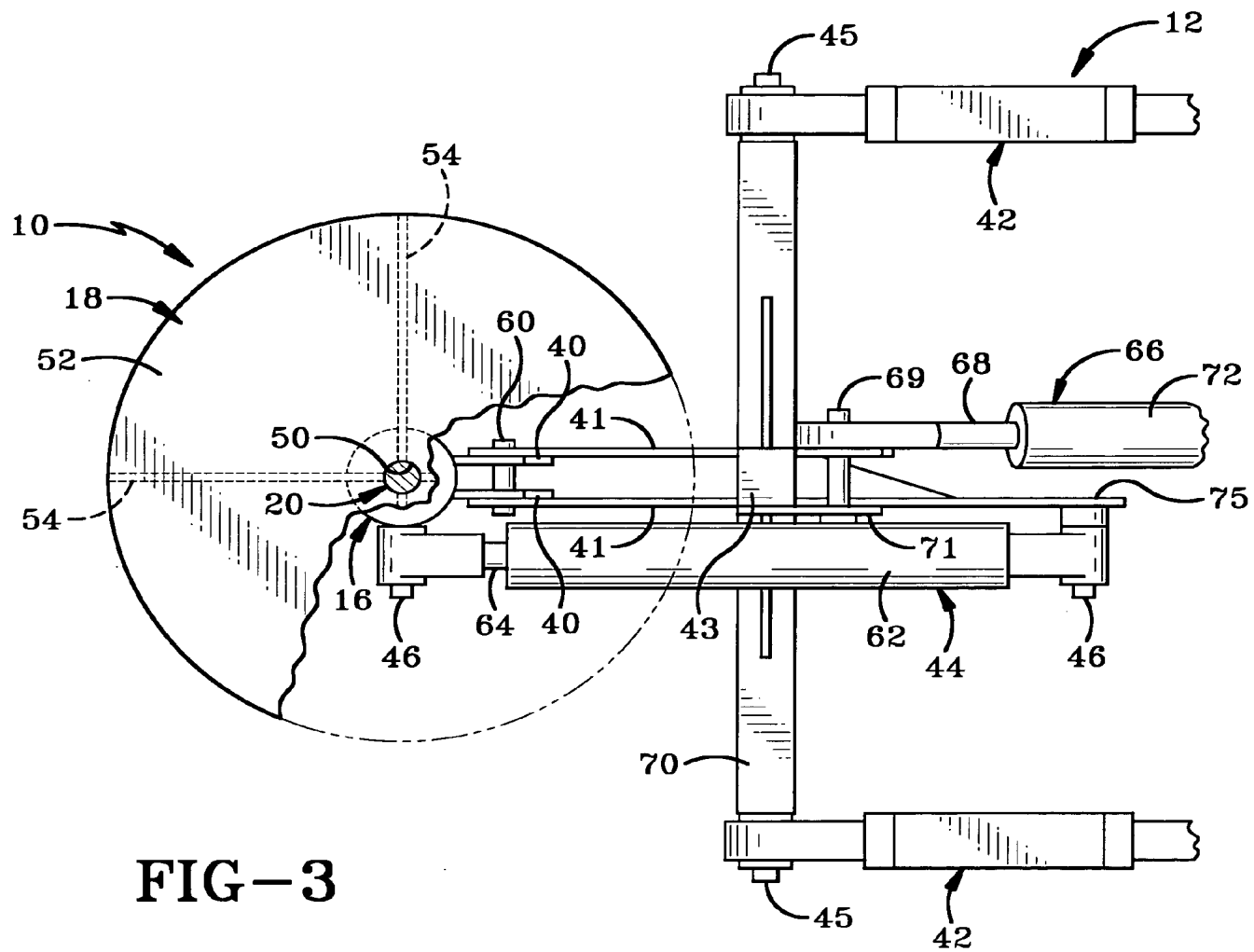
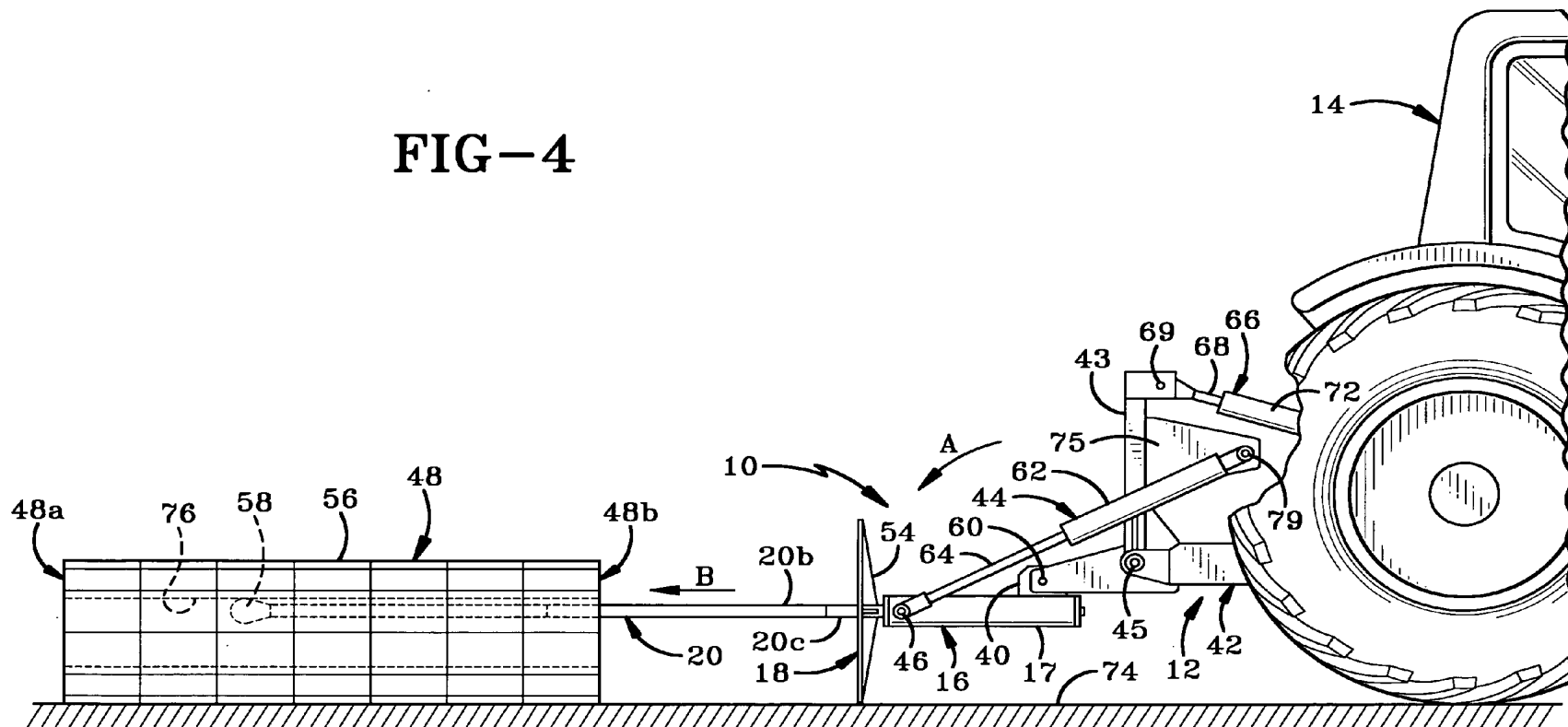


FIG-4



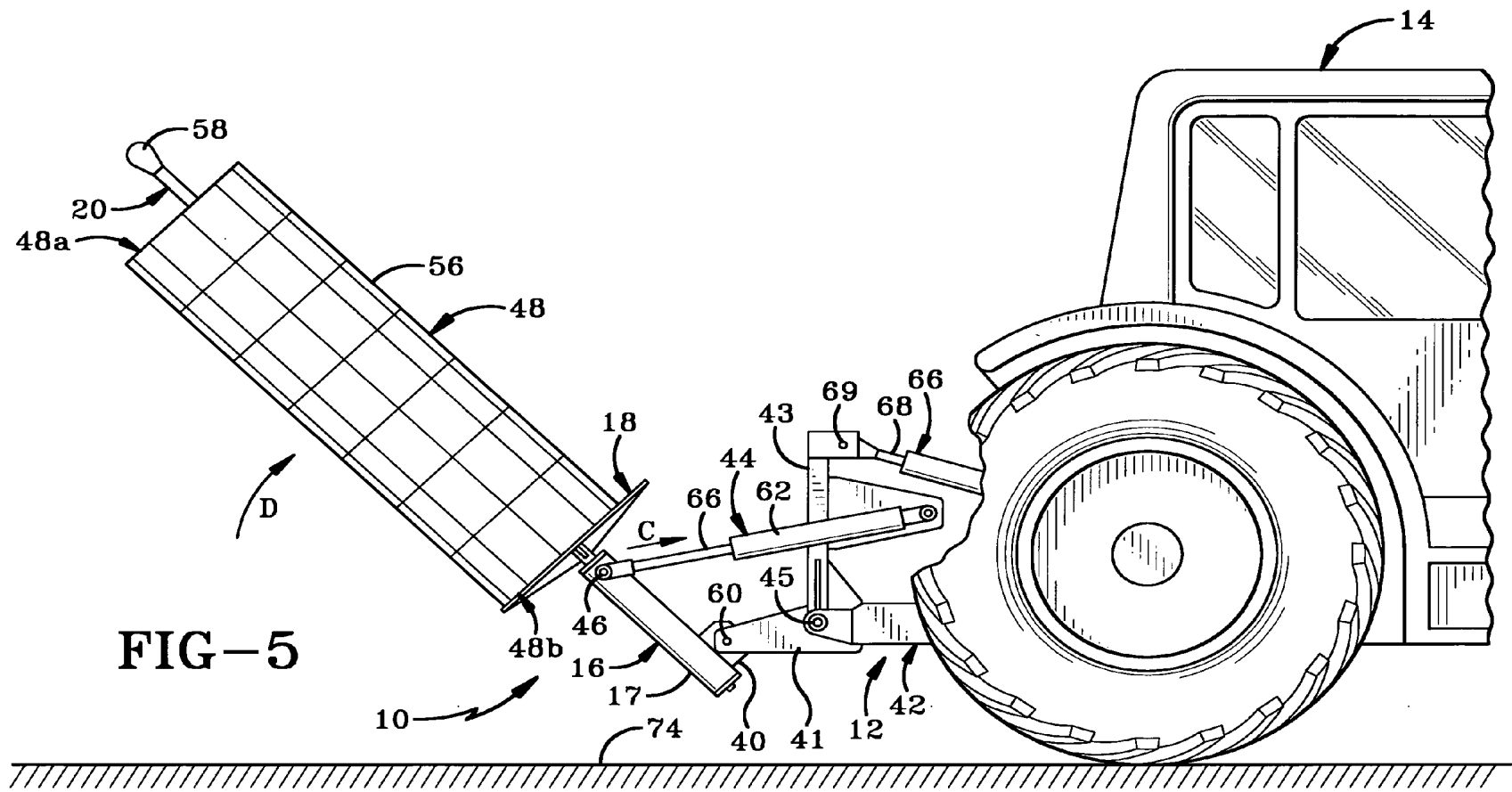


FIG-5

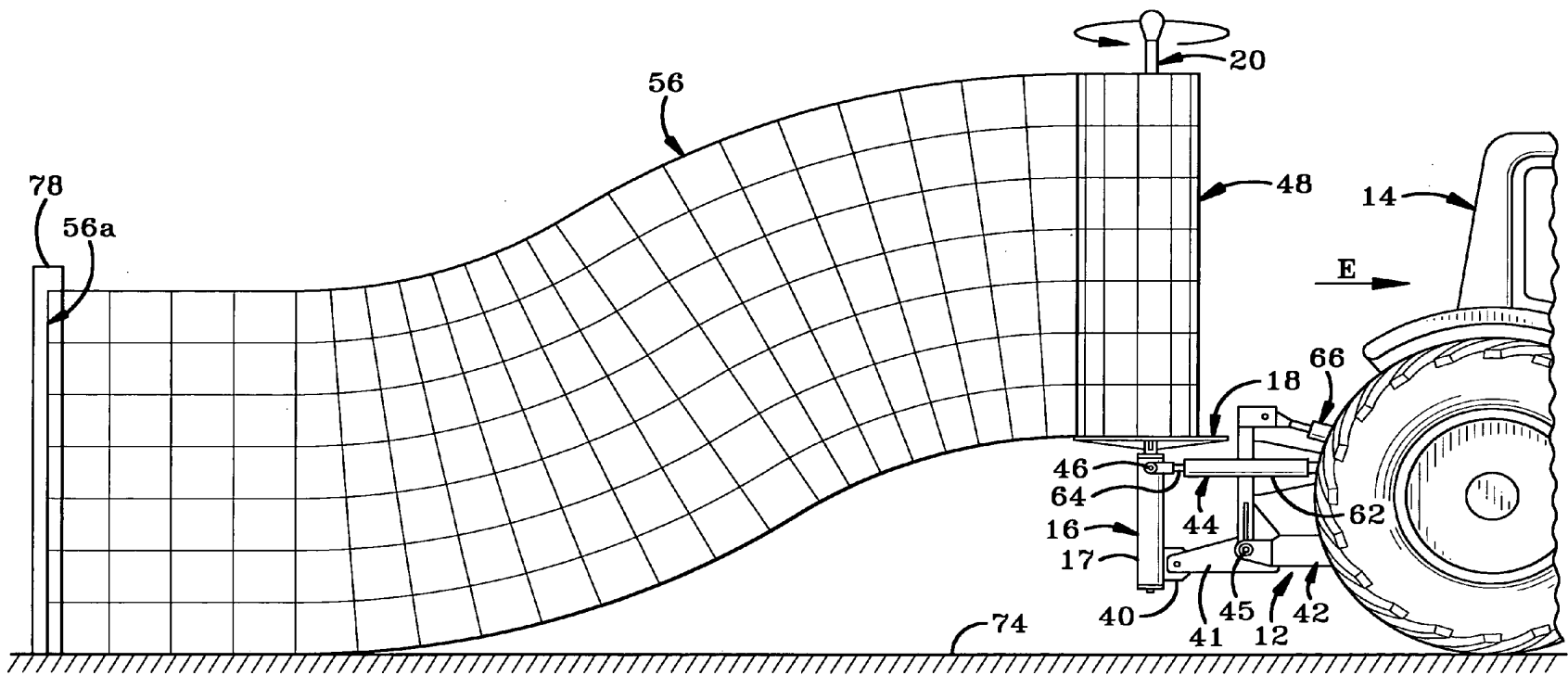


FIG-6

APPARATUS FOR LIFTING AND SUPPORTING FENCE ROLLS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from U.S. Provisional Application Ser. No. 60/781,270, filed Mar. 10, 2006, the entire specification of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Technical Field

[0003] This invention generally relates to fence construction. More particularly, the invention relates to installation of wire fences. Specifically, the invention relates to a device for lifting and supporting rolls of wire fencing during installation of the same.

[0004] 2. Background Information

[0005] Wire fencing is used in a wide variety of applications including enclosing pastures, yards and industrial properties. There are numerous types of wire fencing including mesh fencing, chain link and galvanized wire. All of these types of wire fencing are manufactured and then rolled into a cylindrical shape for transportation and sale. Because of the nature of the wire fencing, the rolls of fencing are extremely heavy and difficult to lift and move about. This is especially problematic for a farmer, for instance, who wishes to install a fence around a pasture and has to keep lifting, moving and unrolling sections of the fencing as he works. Furthermore, because of the metallic nature of the fencing, it is desirable to keep the roll in as upright a position as possible during installation in order to reduce the tendency for the fencing to become bent and twisted.

[0006] There is therefore a need in the art for a device to assist an installer to lift and support a roll of wire fencing during the installation process.

SUMMARY OF THE INVENTION

[0007] The device of the present invention is provided to lift and support a roll of wire fencing during installation thereof and is attachable to a standard three-point hitch mounted on a vehicle such as a tractor. The apparatus comprises a base which is pivotally connected to the hitch and a post that extend outwardly from the base and is insertable into an axial bore in the roll of fencing. The apparatus further includes a platform mounted at right angles to the post. The three-point hitch is activated to move the apparatus between a first position, where the post is oriented vertically, and a second position where the post is oriented horizontally. The apparatus is maintained in the first position when not in use. When the hitch is activated, the apparatus is moved into the second position, the vehicle is driven toward the roll of fencing to insert the post into the bore of the roll. The hitch is again activated to rotate the apparatus back into the first position. This movement causes the post to lift the roll of wire fencing off the ground. When the post is again in the first position, the end of the roll is supported on the platform. A first end of the wire fencing is secured to a fence post and the vehicle is driven forward to unroll a section of wire fencing from the roll. When the fencing operation is completed, the hitch is activated to

move the apparatus from the first position back to the second position so that the roll of fencing may be removed therefrom.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The preferred embodiments of the invention, illustrative of the best mode in which applicant has contemplated applying the principles, are set forth in the following description and are shown in the drawings and are particularly and distinctly pointed out and set forth in the appended claims.

[0009] FIG. 1 is a side view of the lifting and supporting apparatus in accordance with the present invention, and shown attached to a tractor;

[0010] FIG. 2 is an enlarged partial view of the lifting and supporting apparatus connected to a three-point hitch mounted on the tractor;

[0011] FIG. 3 is a top view of the lifting and supporting apparatus taken through line 3-3 of FIG. 2;

[0012] FIG. 4 is a side view of the lifting and supporting apparatus showing the orientation of the apparatus as it is inserted into the bore of a roll of wire fencing;

[0013] FIG. 5 is a side view of the lifting and supporting apparatus as it is being raised and showing the roll of fencing being held thereon; and

[0014] FIG. 6 is a side view of the lifting and supporting apparatus shown in a substantially vertical position where the fencing is supported in a position suitable for transportation and for a section of the wire fencing to be unrolled therefrom.

DETAILED DESCRIPTION OF THE INVENTION

[0015] Referring to FIGS. 1-3, there is shown an apparatus for lifting and supporting a roll of fencing thereon in accordance with the present invention and generally indicated at 10. Apparatus 10 is shown connected to a standard three-point hitch 12, which in turn is mounted onto a vehicle, namely a tractor 14. Hitch 12 may be any suitable three-point hitch known in the art. In the attached figures, hitch 12 includes an upper link 66 and a pair of lower links 42 that are secured to a portion of the frame of the tractor 14. Upper link 66 may be hydraulically or manually extendable to alter the position of the uppermost connection point of hitch 12 relative to the rear end of tractor 14. In the preferred embodiment of the invention, upper link 66 includes a rod 68 and a manually rotatable cylindrical member 72. When member 72 is rotated in a first direction, rod 68 is extended outwardly away from the rear end of tractor 14. When member 72 is rotated in a second and opposite direction, rod 68 is retracted toward the rear end of the tractor 14.

[0016] In accordance with a specific feature of the present invention, the lifting and supporting apparatus 10, that is secured to hitch 12, comprises a base 16, a platform 18 and a post 20.

[0017] Base 16 includes a generally cylindrical member 16a and a connector portion 16b (FIG. 2). Cylindrical member 16a has a peripheral outer wall 17, first and second ends, 19, 21 and an axial bore 22 therethrough. A pair of spaced-apart bushings 24, 26 and associated bearings 28, 30 are disposed within bore 22. Bushings 24, 26 are located proximate a recessed area in each of first and second ends 19, 21 of base 16. First and second end caps 32, 34 are

provided to engage first and second ends 19, 21 respectively, and to enclose bushings 24, 26 within bore 22.

[0018] Cylindrical member 16a is secured to hitch 12 by way of a plurality of plates and bars which constitute the connector portion 16b of base 16. Connector portion 16b includes one or more flanges 40 and plates 41, a crossbar 70, a tie-bar 43, a flange 71, a second plate 75 and an actuating arm 44. Flanges 40 extend outwardly from the peripheral outer wall 17 of cylindrical member 16a, proximate second end 21 thereof. Flanges 40 are pivotally secured to a pair of plates 41 by a pin 60. Plates 41 connect to crossbar 70 which is disposed substantially at right angles thereto. Tie-bar 43 extends vertically upwardly away from a central portion of crossbar 70 and flange 71 is welded to an upper end of tie-bar 43 and is disposed substantially at right angles thereto. Second plate 75 extends outwardly from tie-bar 43 intermediate crossbar 70 and flange 71. A first end of actuating arm 44 is pivotally connected by a fastener 79 to said second plate 75. A second end of actuating arm 44 is pivotally secured by a pin 46 to cylindrical member 16a, proximate a first end 19 thereof. Actuating arm 44 includes a hydraulic cylinder and a piston rod 64. The hydraulic connections for actuating arm 44 are not shown in the attached figures for the sake of clarity.

[0019] The platform 18 of the lifting and supporting apparatus 10 is positioned immediately above first end cap 32 of cylindrical member 16a. Platform 18 is oriented substantially at right angles to the cylindrical member 16a and is substantially circular in shape. Platform 18 includes a planar surface 52 that is of a diameter greater than the diameter of cylindrical portion 16a base 16. An aperture 50 is provided in the center of platform 18 and is sized to receive post 20 therethrough. A plurality of strengthening ribs 54 are provided on the underside of platform 18. Ribs 54 radiate outwardly away from the center of platform 18 and are substantially triangular in shape, with the apex of the triangle being disposed proximate the peripheral outer edge of platform 18. The base of the triangle is disposed proximate the aperture 50 in platform 18.

[0020] Post 20 is an elongated cylindrical member that preferably comprises a plurality of threadably engageable sections, such as 20a, 20b, and 20c (FIG. 1). Sections 20a, 20b and 20c may be selectively added or removed to create a post of selectively variable length. Post 20 has a substantially bulbous terminal end 58. Terminal end 58 is generally rounded in shape and has a maximum diameter that is greater than the diameter of post 20. Post 20 extends through aperture 50 in platform 18, through aligned apertures (not numbered) in first end cap 22, through bushings 24 and 26. A second end 20c of post 20 abuts an interior surface of second end cap 24. A threaded bolt 36 is inserted through an aperture (not numbered) in second end cap 24 and into second end 20c of post 20, thereby securing post 20 within base 16. Bushings 24, 26 and their associated bearings permit post 20 to rotate within base 20. It will be understood, however, that post 20 may alternatively be fixedly mounted within base 16. Platform 18 preferably is fixedly secured to post 20 so that platform 18 is substantially prevented from sliding up or down on post 20 as apparatus 10 is maneuvered by hitch 12. Furthermore, platform 18 preferably is secured to post 20 in such a manner that platform 18 rotates in unison with post 20 when a section of fencing 56 is rolled off roll 48. Alternatively, though not shown, platform 18 may be fixedly secured to base 16 so that platform 18 remains

stationary when post 20 rotates within base 16 in response to roll 48 being unwound. Alternatively, though not shown, post 20 may be fixedly attached to base 16 and platform 18 is mounted for rotation about post 18 when roll 48 is unwound.

[0021] The apparatus 10 of the present invention is used in the following manner. Apparatus 10 is secured to three-point hitch 12 on a tractor 14 by securing crossbar 70 of portion 16b of base 16 to lower links 42 of hitch 12 using fasteners 45. Flange 71 is secured to an end of rod 68 of upper link 66 by a pin 69. The first position of apparatus 10 is shown in FIGS. 2 and 6. In the first position, apparatus 10 is secured to hitch 12 and post 20 is disposed substantially vertically. The operator activates actuating arm 44 of hitch 12, causing piston rod 64 to be extended in length (FIG. 4). As piston rod 64 is extended, apparatus 10 pivots about pin 60 causing base 16, platform 18 and post 20 to be rotated in an arc away from the rear end of tractor 14 as indicated by arrow "A" (FIG. 4). When piston rod 64 is fully extended (FIG. 4), surface 52 of platform 18 is substantially perpendicular to the ground 74. In this second position, post 20 extends rearwardly and substantially horizontally away from tractor 14 and is disposed substantially parallel to ground 74. The operator then reverses tractor 14 in the direction of arrow "B" toward roll 48 so that the bulbous end 58 of post 20 is inserted into bore 76 of roll 48. Tractor 14 is reversed until the bulbous end 58 lies outwardly beyond end 48a of the roll 48. The operator activates actuating arm 44 in a reverse direction, causing piston rod 64 to be retracted into cylinder 62 in the direction of arrow "C" (FIG. 5). As piston rod 64 retracts, base 16 rotates in the opposite direction about pivot pin 60. This causes post 20, with the now-captured roll 48, to be arcuately lifted off ground 74 in the direction of arrow "D". When piston rod 64 is in its fully retracted position (FIG. 6), post 20 is in the first position and is, once again, positioned substantially vertically relative to ground 74. The second end 48b of roll 48 rests on and is supported by surface 52 of platform 18. In this first position, roll 48 is fully supported upon platform 18 and terminal end 58 of post extends vertically out of roll 48.

[0022] Referring to FIG. 6, the installer then secures a free end 56a of the wire fencing 56 to a fence post 78 that is secured within the ground 74. The operator drives the tractor 14 slowly forward in the direction of arrow "E". This movement causes roll 48 to rotate. It will be understood that platform 18 may rotate with roll 48, post 20 may rotate with roll 48, or both platform 18 and post may rotate with the roll 48. The rotation causes a section of fencing 56 to become unrolled from roll 48. When a sufficient length of fencing 56 has unrolled, the operator stops tractor 14 and secures that portion of fencing 56 to a second fence post (not shown) that is spaced a distance from first fence post 78. The operator then drives the tractor 14 forward yet again in the direction of arrow "E", allowing a second length of fencing 56 to unroll from roll 48. At a second predetermined point, tractor 14 is stopped again, the operator secures the second section of fencing 56 to a third fence post (not shown) and so on.

[0023] When sufficient fencing 56 has been dispensed from roll 48 and the fencing is fully installed as described above, the operator cuts the installed fencing free from roll 48 using conventional wire cutters, for example. Tractor 14 is then driven to a storage facility with roll 48 held on the vertically oriented post 20. Roll 48 is then lowered back into contact with the ground by activating the actuating arm 44

of hitch 12 to extend the piston rod 64 in the opposite direction of arrow "C" (FIG. 5). This causes post 20 and associated roll 48 to be moved from the first position to the second position, thereby rotating post 20 from a vertical orientation downwardly toward the ground in the opposite direction to arrow "D". When the post 20 is in the second position and is disposed substantially horizontally and roll 48 is in abutting contact with the ground, tractor 14 is moved forwardly away from roll 48. This causes post 20 with its bulbous end 58 to be withdrawn from within bore 76 of roll 48. Actuating arm 44 of hitch 12 is activated so that post 20 is rotated back from the second position to the first position. The apparatus 10 may be completely detached from tractor 14 by removing pins 46 and 60.

[0024] In the foregoing description, certain terms have been used for brevity, clearness, and understanding. No unnecessary limitations are to be implied therefrom beyond the requirement of the prior art because such terms are used for descriptive purposes and are intended to be broadly construed.

[0025] Moreover, the description and illustration of the invention is an example and the invention is not limited to the exact details shown or described.

1. An apparatus for lifting and supporting a tubular roll of wire fencing during installation of said fencing; said apparatus comprising:

a base adapted to be pivotably connected to a three-point hitch on a vehicle;

a post extending outwardly away from the base and adapted to be received through a bore in said tubular roll; and wherein said base is movable upon activation of said hitch between a first position where the post is vertically oriented, and a second position where the post is horizontally oriented.

2. The apparatus as defined in claim 1, wherein the post is rotatably mounted to the base.

3. The apparatus as defined in claim 2, wherein the base defines a bore therein and a first end of the post is received within the bore of the base.

4. The apparatus as defined in claim 3, wherein the base is substantially cylindrical in shape, having a peripheral wall and first and second ends; and wherein said bore in said base extends between the first and second ends thereof.

5. The apparatus as defined in claim 4, further comprising at least one set of bushings disposed within the bore of the base between said post and said peripheral wall.

6. The apparatus as defined in claim 6, further comprising first and second end caps provided on the first and second ends of the base; and wherein a first end of the post is secured to the first end and said post extends outwardly through said second end cap and terminates in a remote terminal end.

7. The apparatus as defined in claim 6, wherein the terminal end of the post is substantially rounded.

8. The apparatus as defined in claim 6, wherein the post is of a first diameter and the terminal end thereof is of a second diameter, and the second diameter is greater than the first diameter.

9. The apparatus as defined in claim 6, further comprising at least one bushing, said bushing being disposed within the bore of the base and proximate one of the first and second end caps.

10. The apparatus as defined in claim 1, wherein the post is variable in length.

11. The apparatus as defined in claim 10, wherein the post comprises a plurality of elongated sections that are selectively attachable one to another to vary the length of the post.

12. The apparatus as defined in claim 1, further comprising a platform disposed on one of the base and post; said platform being oriented so as to support an end of the tubular roll of fencing thereon when the post is received through the bore in the roll.

13. The apparatus as defined in claim 12, wherein the platform is disposed substantially at right angles to the post.

14. The apparatus as defined in claim 13, wherein the post is rotatably secured to the base and the platform is fixedly secured to the post; whereby the platform is rotatable with the post.

15. The apparatus as defined in claim 14, wherein the platform is secured to the post a spaced distance away from the base.

16. The apparatus as defined in claim 15, further comprising a central aperture formed in the platform; and wherein said post extends through the central aperture therein.

17. The apparatus as defined in claim 16, further comprising a plurality of ribs formed on the platform, said ribs radiating outwardly away from the central aperture in the platform.

18. The apparatus as defined in claim 1, further comprising a first flange extending outwardly away from the base; and wherein said first flange is adapted to pivotally engage a first link of the three-point hitch on the vehicle.

19. The apparatus as defined in claim 18, further comprising a second flange extending outwardly away from the base a spaced distance from the first flange; and wherein the second flange is adapted to pivotally engage a hydraulic cylinder on the three-point hitch.

20. A method of installing wire fencing that is retained on a roll having a bore therethrough; said method comprising the steps of:

- attaching a roll-retaining apparatus to a three-point hitch of a vehicle;
- inserting a post on the roll-retaining apparatus into the bore of the roll of fencing;
- activating the hitch to rotate the roll-retaining apparatus so that the post thereof is vertically oriented;
- connecting a free end of the wire fencing to a fence post that extends outwardly from the ground;
- moving the vehicle away from the fence post so as to unwind a section of fencing from the roll.

21. The method as defined in claim 20, wherein the step of inserting the post of the roll-retaining apparatus into the bore of the roll includes the steps of:

- positioning the roll of fencing horizontally on a surface;
- activating the hitch to orient the post of the roll-retaining apparatus horizontally; and
- moving the vehicle toward the roll of fencing to introduce the post thereof into the bore of the roll.

22. The method as defined in claim 21, further comprising the steps of:

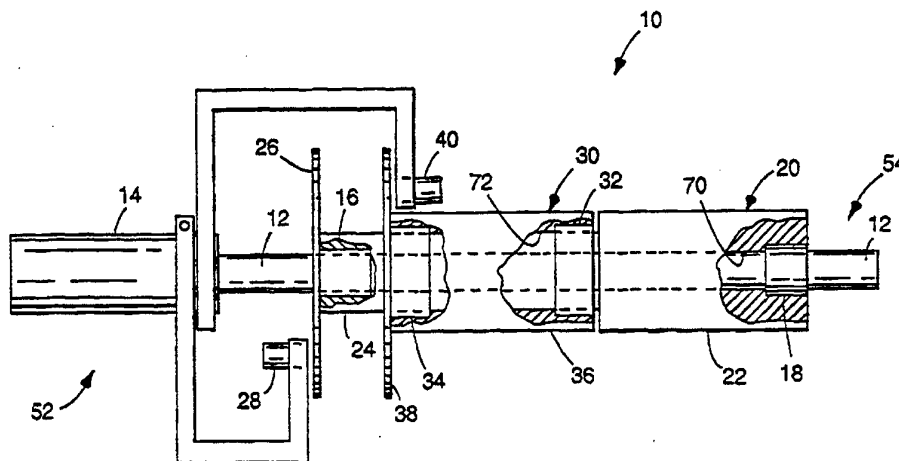
- securing the unwound section of fencing between two fence posts;
- cutting the secured section of fencing free from the fencing on the roll;
- activating the hitch to orient the post of the roll-retaining apparatus horizontally; and
- moving the vehicle away from the roll of fencing to remove the post thereof from the bore of the roll.



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(54) Title: INDEPENDENTLY TENSIONED DUAL UNWIND AND TAKE-UP MECHANISM USING A COMMON SHAFT MOUNTING



(57) Abstract

A mechanism for supporting at least two rolls for an indefinite length web process. The mechanism includes a shaft having a first end and a second end. A first spindle including a mounting portion and a shank portion is rotatably mounted on the shaft such that the mounting portion of the spindle is proximate the second end of the shaft and the shank portion is proximate the first end of the shaft. The first spindle includes a mounting portion and the shank portion. The mounting portion is adapted to telescopically accept and support one of the rolls. Associated with the first spindle and located proximate the first end of the shaft is a brake or motor for controlling the rotation of the first spindle about the shaft. A second spindle is rotatably mounted on the shank portion of the first spindle, preferably with low-friction bearings so that the second spindle may rotate independently apart from the first spindle. Finally, a brake or motor for controlling the rotation of the second spindle about the shank portion of the first spindle is provided and located proximate the first end of the shaft. Such a mechanism allows independent unwinding or winding tension of the materials delivered from or wound on each of the rolls. Additionally, the mechanism allows for the exchange of depleted rolls for full rolls without disassembly of the rotation control means.

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**INDEPENDENTLY TENSIONED DUAL UNWIND AND TAKE-UP
MECHANISM USING A COMMON SHAFT MOUNTING**

Field of the Invention

5 This invention relates to indefinite length web converting processes. More particularly, the invention relates to dispensing more than one web stock into a converting apparatus at the same point under predictable tensions.

Background of the Invention

10 A number of industrial processes require performing several steps on an indefinite length sheet or web stock substrate. These processes are typically referred to as converting processes and are commonly used to manufacture adhesive rings, ostomy devices, stickers, tabbing materials, packages, wound dressings, labels and electrodes to name a few. In converting processes, a substrate usually begins in
15 roll form and is fed into the process off of the roll. Once fed into the process, the substrate is subjected to such steps as rotary die cutting, sealing, creasing, and laminating. An example of a converting process used to prepare wound dressings is shown in U.S. Patent No. 4,328,057 issued to Gutow.

 Figure 1 of the Gutow patent is similar to Figure 1 herein. Figure 1
20 illustrates a schematic of creating a laminated substrate and converting the laminate into "windowed pressure sensitive labels." Supply rolls 101 and 103 are fed into the laminating roller 105. Supply roll 101 includes a backing web (also referred to as 101) and supply roll 103 provides a label web (also referred to as 103). The label web 103 is provided with a pressure sensitive adhesive on its underside 107 to allow
25 the laminating roller 105 to laminate the label web 103 and the backing web 101 together, resulting in a laminated substrate 111. After laminating, the laminated substrate is subjected to such converting procedures as printing, which is performed by printing roller 118. The printed laminate is then passed around successive guide rollers 120 and 121.

After the web laminate is printed, it is passed through die cutting roller 122 and anvil roller 123. Gutow discloses that the die cut only extends through the label web of the laminate substrate. Additional converting steps such as removing the window cut in the label web, adding an adhesive and release liner to the laminate substrate, and cutting each individual dressing apart are placed
5 sequentially in the process line after the die cutting operation. If additional layers are required in a particular dressing, the layers are often added sequentially with respect to the other procedures performed during the process.

Two difficulties exist with the above-described procedure. The first
10 is adding layers to the substrate. In order to add layers to the substrate, it is important that the layers are in a particular registration with respect to the cross-web direction of the backing. All layers must also remain wrinkle-free. To date, maintaining the layers in a wrinkle-free condition was in part accomplished by maintaining the web at predictable tensions at certain points during the process.
15 This tension gauging was achieved by either providing a predictable initial tension to the various webs as they were unwound from their supply rolls, for example, by using brakes on the supply rolls to supply an initial tension to the substrates fed into the converting process.

Second, maintaining proper registration and eliminating wrinkles is
20 difficult if it is necessary to add two or more substrate layers at the same point in the process, significant problems with maintaining proper registration and eliminating wrinkles arise. In the process described above, this arises when adding the initial substrates from supply rolls 101 and 103. This is also true if two or more additional substrate layers are added later in the process, and when different unwind
25 tensions are required for the two or more substrate rolls. Varying unwind tensions are necessary if the materials have different thicknesses or different roll diameters so as to require different unwind speeds.

Two methods exist in the art which attempt to overcome these challenges. The first method involves providing two separate axle shafts, each of
30 which supports a supply roll and each of which is equipped with a brake. One of

the two axle shafts is displaced away from the insertion point with proper supports and is supplied with idler rollers to guide the web toward the insertion point. This arrangement has proved unacceptable for a couple of reasons. The structure is quite complicated due to the requirement of providing a remote brace for the
5 displaced axle shaft. It is difficult also to maintain the proper tram of the additional rollers in order to eliminate introduction of wrinkles in the layers.

A second method of adding two or more additional layers to the main web involves placing two supply rolls having separate bearings and separate brakes on the same axle shaft. The brakes are placed on opposite ends of the axle
10 shaft. This arrangement is also undesirable because whenever it is necessary to exchange a full supply roll for a depleted roll, it is necessary to disassemble at least one of the brake assemblies.

Summary of the Invention

15 This invention provides a mechanism that allows placement of independently tensioned supply rolls on the same axis directly at the point where the supply rolls feed material into a converting process, and which allows for changing of supply rolls without disassembly of tensioning brakes (or drive mechanism or motor).

20 This invention comprises a shaft having a first end and a second end. A first spindle having a mounting portion, a shank portion, and a means for controlling the rotation of the spindle is rotatably mounted on the shaft such that the mounting portion is proximate the second end of the shaft, the rotation controlling means is proximate the first end of the shaft, and the shank portion is located
25 between the mounting portion and the rotation control means. The mounting portion of the first spindle is adapted to accept a supply roll. A second spindle is rotatably mounted on the shank portion of the first spindle. The second spindle is preferably mounted on low-friction bearings to allow the second spindle to rotate independently from the first spindle. A means for controlling rotation of the second
30 spindle is also included and is located proximate the first end of the shaft. The

second spindle further includes a mounting portion for accepting a supply roll located proximate the shaft portion of the first spindle.

If the mechanism of the present invention is used in an unwind situation, the rotation control means preferably are independently controlled brakes.

- 5 Such a mechanism makes it possible to apply independent unwinding tensions to material delivered from different supply rolls.

The invention as defined can also provide side-by-side take-up at the end of a converting line. If the invention is used in a take-up capacity, the means for controlling the rotation of the first and second spindles is a pair of independent
10 motors which drive the spindles at predetermined and preferably adjustable torques.

Also provided is a method of independently tensioning two or more webs supplied from two or more rolls of web stock for further processing. A method comprises providing a shaft having a first end and a second end, a first spindle having a mounting portion and a shank portion, and a second spindle;
15 rotatably mounting the first spindle on the shaft with the shank portion proximate the first end of the shaft and the mounting portion proximate the end of the shaft; rotatably mounting the second spindle on the shank portion of the first spindle, mounting a first roll of web stock on the first spindle; mounting a second roll of web stock on the second spindle; feeding the webs from the first and second rolls
20 into converting apparatus; independently controlling rotation of the first and second spindles with a controller located proximate the first end of the shaft to independently control the tension of the webs from the first and second rolls.

Description of the Drawings

25 FIG. 1 is schematic perspective view illustrating a prior art converting process for preparing wound dressings.

FIG. 2 is a top, partially cut-away view of an exemplary unwind tensioning mechanism according to the present invention.

FIG. 3 is a top view of the present invention with two supply rolls
30 mounted thereon.

FIG. 4 is a cut away schematic view of a partial converting operation using the present invention.

FIG. 5 is a plan view of a bandage.

FIG 6 is a perspective sectional view of the bandage of Figure 5.

5 FIG 7 is a cross-sectional view of two attached bandages of Figures 6 before slitting to separate the bandages.

FIG 8 is a side view in partial cross section of one machine according to the present invention.

10 FIG 9 is a view of the machine of Figure 1 taken along the web travel direction.

FIG 10 is an enlarged perspective view of one preferred means for moving the follower gear across the main gear.

FIGS 11A and 11B are schematic diagrams illustrating the concept underlying registration adjustment of machines according to the present invention.

15 FIG 12 is a schematic representation of a helical main gear according to the present invention.

FIG 13 is a plan view of a bandage produced on a machine according to the present invention.

FIG 14 is a perspective view of the bandage of Figure 6.

20 FIG 15 is a cross-sectional view of the web used to form bandages according to Figures 13 and 14.

FIG 16 is a web flow diagram of one converting process on a machine according to the present invention.

FIG 17 is an enlarged view of one converting station in Figure 9.

25 FIG 18 is an enlarged view of a die roll used in converting station depicted in Figure 17.

FIG 19 is an enlarged view of one converting step in the process depicted in Figure 16.

30 FIG 20 is a view of one preferred unwind stand for use in the converting process depicted in Figures 16 and 19.

FIG 21 is an enlarged view of a sheeting die for use in the converting process of Figure 16.

FIG 22 is a schematic diagram of a machine according to the present invention including a variety of different converting station side plates.

5

Detailed Description of the Invention

FIG. 2 illustrates a top view of an exemplary unwind tensioning mechanism 10 according to the present invention. The mechanism 10 includes shaft 12 having a first end 52 and a second end 54. The first end 52 of shaft 12 extends from a mounting 14 adapted for fixing to any support such as a converting machine commonly known in the art which may require side-by-side dispensing from two different rolls. Such rolls are herein referred to as "supply rolls" because they provide a supply of the indefinite length substrate for processing. Shaft 12 is preferably a rigidly fixed shaft.

15 A first spindle 20 having a longitudinal bore 70 therein receives shaft 12 so as to rotatably mount spindle 20 on roller bearings 16 and 18 on shaft 12. First spindle 20 includes a mounting portion 22, and a shank portion 24. Shank portion 24 of first spindle 20 is mounted proximate the first end 52 of shaft 12. Mounting portion 22 is mounted on shaft 12 proximate the second end 54 of shaft 20 12. Mounting portion 22 is fashioned to accept a supply roll 60 as shown in Figure 3. Mounted at the end of the shank portion 24 of first spindle 20 and proximate the first end 52 of shaft 12 is a first brake disk 26. Brake disk 26 is adapted to interact with a first brake actuator 28 to provide a variable resistance to rotation of first spindle 20 about shaft 12. The first brake assembly, comprised of disk 26 and 25 actuator 28, sets and maintains tension on the web substrate 64 being unwound from supply roll 60, which is mounted on the mounting portion 22 of first spindle 20. Figures 2 and 3 show the longitudinal bore 70 in spindle 20 extending throughout the length of spindle 20, with second end 54 of shaft 12 projecting outward from spindle 20. Alternatively, the longitudinal bore of the first spindle

may be closed to cover the second end of the shaft. The shank portion of the first spindle is longer than the second spindle.

5 A second spindle 30 has a central bore 72 therethrough which receives the shank portion 24 of first spindle 20. The second spindle 30 is rotatably mounted on roller bearings 32 and 34 placed directly on the outer surface of the shank portion 24 of first spindle 20. The mounting portion 36 of the second spindle 30 is adapted to accept a second supply roll 62 as shown in Figure 3. In a preferred embodiment bearing 32 and 34 are at longitudinal or axial positions between bearings 16 and 18 of first spindle to enhance stability of the mechanism. A second
10 brake disk 38 is mounted on the second spindle 30 proximate the first end 52 of shaft 12. The second brake disk 38 interacts with a second brake actuator 40 to provide a variably adjustable resistance to rotation of the second spindle 30 about first spindle 20.

Mounting portion 22 and mounting portion 36 may have equal or
15 unequal outside diameters as suits the intended application.

Both brake assemblies of the invention, 26 and 28, 38 and 40 are located on the same end of the spindles 20 and 30. As shown in Figures 2 and 3, both brake assemblies 26 and 28, 38 and 40 are located proximate the first end 52 of shaft 12. This arrangement allows an operator to load and unload supply rolls 60 and 62 from mounting portions 22 and 36 off second end 54 of shaft 12 without
20 disturbing brake assemblies 26 and 28, 38 and 40 or requiring removal of shaft 12 from its mounting. According to the present invention, first and second spindles 20 and 30 are able to freely rotate apart from each other and are separately controlled by the independent brake assemblies allowing each separate brake to exert a
25 different tension on each supply roll. A brake assembly for the first spindle is closer to the first end of the shaft than a brake assembly of a second spindle.

Although Figures 2 and 3 illustrate a mechanism of the invention which includes mountings for two supply rolls, one skilled in the art will recognize that a mechanism is easily constructed according to the invention to include more
30 than two supply roll mountings. One such construction would require fashioning

second spindle 30 similar to first spindle 20 to include both a mounting portion and a shaft portion so that a third spindle could be mounted on the shaft portion of the second spindle. Additionally, a third brake assembly would be provided to supply an independent tension to the web fed off of the third supply roll mounted on the
5 third spindle. One aspect of this invention is that it allows more than one supply roll to rotate about a common axis.

The mechanism of the present invention could also be used in a tensioned take-up capacity at the end of a converting process or other process requiring a tensioned take-up. This could be accomplished by substituting motors
10 for the brake assemblies. Direct drive gears could be placed on shaft 12 in place of brake disks 26 and 38. Motor gears could actuate the direct drive gears supplying a tensioned wind-up capacity to the present invention. Alternatively, belts or chains placed about spindles 20 and 30 and driven by motors could drive spindles 20 and 30. It is contemplated that motors commercially available as Gast #4AM-FRV-63A
15 from Midwest Machine Tool Supply of Minneapolis, MN would be suitable for adapting the present invention for independently controlling the wind-up torque when the invention is used in a take-up capacity. Further, in the unwind application in an alternative to brakes, the tension could be regulated against motors which tolerate a slipping action and generate a predicable torque when so operated.

20 Figure 4 illustrates a cut away schematic of a converting process. The converting process shown is typical of the type used to prepare bandages. As shown in Figure 4, the present invention is used both in the unwind capacity 7 and in the wind-up capacity 380. Supply roll 488a includes a liner substrate (also referred to as 488a) and supply roll 488b also provides a liner substrate (also
25 referred to as 488b). Supply roll 486 also provides a liner substrate (also referred to as 486). As shown in Figure 4, the present invention allows side-by-side mounting of the supply rolls 488a and 488b on the same axis 78 and allows feeding of the liner substrates into the converting process at virtually the same point. Independently controlled disc brakes supply tension to supply rolls 488a and 488b
30 to allow exertion of different tensions on each supply roll.

Figures 5 & 6 illustrate a representative bandage 478. The bandage 478 includes a substrate layer 480, a layer 482 of pressure-sensitive adhesive and an absorbent pad 484. The bandage 478 also preferably includes two liners to protect both the adhesive layer 482 and the pad 484 from contamination before use. The bottom liner 488 is provided on one side of the bandage 478 and a top liner 486 is provided on the opposite side of the bandage 478. The top liner 486 partially overlies the bottom liner 488 to provide the described level of protection for pad 484.

A preferred method of manufacturing such bandages is in a "two-up" configuration, i.e., two bandages are produced adjacent to each other in the transverse web direction. The bandages are depicted "two-up" cross-section in Figure 7 before being converted by a sheeting die into actual bandages 478. As a result, a single top liner 486 is provided in the center of the web 490 while two bottom liners 488a and 488b (referred to collectively as 488) are provided on either side of the web 490. The feeding of these liners 488a, 488b and 486 into the converting process is depicted in Figure 4. The cut-away portion of Figure 4 could include many converting operations useful in manufacturing bandages, e.g., sheeting, slitting and laminating to name a few.

The dual wind-up capacity allows winding of scrap substrate onto take-up roller and the winding of the product onto take-up roller 403. Rollers 401 and 403 are mounted on the same axis 380. Independently controlled drive motors supply power to rotate the rollers 401 and 403.

The mechanism and process described herein can also be used with the rotary drum converter described below.

For the purposes of converting wound dressings, the term "substrate" includes but is not limited to films such as polyurethane films, papers, woven or nonwoven webs. If the present invention is used in a converting process other than for manufacturing wound dressings, the term substrate is defined as any indefinite length material used to manufacture the desired end product as known in the art.

As used herein, "proximate" is used as a relative term such that the shank portion of the first spindle is "proximate" the first end of the shaft if it is closer to the first end of the shaft than the mounting portion of the first spindle.

One preferred embodiment of a rotary converting machine useful
5 with the present invention is depicted in Figures 8 & 9. As shown, a central process drum 122 is rigidly mounted on primary axle 148. Axle 148 is rotatably mounted on support 126 as best shown in Figure 8. Helical main gear 144 is also rigidly mounted on the primary axle 148 to ensure that the helical main gear 144 and the process drum 122 rotate in synchrony. A motor in housing 130 rotates pinion 128,
10 which drives main gear 144 which, in turn, rotates process drum 122.

One or more driven nip rolls 132 are optionally provided for applications where it is necessary to convert webs which are elastic and/or delicate. Such materials typically cannot withstand significant amounts of tension at any point in the converting process. Although only one driven roll 132 is depicted
15 upstream from the converting station 134 (process drum 122 rotates counterclockwise in Figure 8), it will be understood that a plurality of driven rolls could be provided around the circumference of process drum 122. In some applications, it may be desirable to locate a driven roll upstream and downstream from each converting station to provide isolation of web tension between
20 converting stations.

Each driven roll 132 preferably is driven by the main gear 44 either through a pinion gear mounted on the roll shaft or through one or more intermediate pinion gears, if necessary. Because the driven rolls are geared to the main gear 144 which rotates in synchrony with the process drum 122, the driven
25 rolls 132 rotate at the same speed as the process drum 122. As a result, tension induced in the web prior to the nip between the driven roll 132 and process drum 122 is isolated from the remainder of the converting process downstream from that

nip point. That isolation improves registration between converting operations performed around the process drum 122.

Furthermore, tension control and web registration is further enhanced by threading the web such that it maintains contact with the process drum 122 after the initial nip formed by the illustrated driven roll 132 until a point after which all of the converting operations have been completed. That threading, i.e., maintaining contact between the web and process drum 122 from an initial point located upstream from the first converting station until an exit point after the last converting station, is preferred. Alternatively, the web can be threaded around tools located in one or more converting stations, particularly where the web is relatively inelastic and/or has a high tensile strength.

In the preferred embodiment of a rotary converting machine according to the present invention, a plurality of converting stations 134 may be mounted about the circumference of the process drum 122, all but one of which have been removed from Figure 8 for clarity. One arrangement of additional converting stations is depicted schematically in Figure 8 as stations A-C, also located about the circumference of process drum 122.

Each converting station 134 could perform any desired converting step including, but not limited to: coating, laminating, die cutting, painting, slitting, sheeting or component placement. The specific tools used in each converting station 134 dictate the converting operation performed at the station. As used in connection with the present invention, it will be understood that "tool" refers to any rolls, coaters, blades, etc. designed to accomplish any desired converting operation.

One skilled in the art will appreciate that not every converting station 134 will perform operations requiring registration with the operations performed by other converting stations located around process drum 122. For example, converting stations which perform slitting or other operations in the web

travel direction do not require registration. Furthermore, the first operation on a web which includes a cross-web component will typically establish the points from which registration of succeeding converting operations will be measured.

For example, a first converting operation may die cut one layer of a multilayer web in a controlled-depth die cut operation. A succeeding converting operation may include a second die cut which must be accurately placed relative to the initial die cuts. It is that second converting station at which the registration apparatus of the present invention will be most useful. As a result, a machine according to the present invention may include a plurality of converting stations, at least one of which is a registrable converting station according to the present invention.

As best seen in Fig. 9, each tool 140a and 140b (referred to collectively as 140) is rigidly attached to a secondary axle (not shown) which is preferably mounted to be substantially parallel to primary axle 148 around which the process drum 122 and helical main gear 144 rotate. In the preferred embodiment, a helical follower gear 152 is rotatably mounted in the converting station 134 to transfer rotary motion of the helical main gear 144 to the tools 140 in the converting station 134.

In the embodiment depicted in Figures 8-10, follower gear 152 is mounted on shaft 150 which allows follower gear 152 to move laterally along shaft 150 while transmitting the rotary motion from helical main gear 144 to the shaft 150. In the preferred embodiment, shaft 150 includes a keyway (not shown) and follower gear 152 includes a key (not shown) which engages the keyway in shaft 150 in a complementary fashion. The keyway and key engage each other such that axial movement of the follower gear 152 along shaft 150 is permitted, but angular rotation of the follower gear 152 relative to the shaft 150 is not permitted. It will be understood that any other mechanism for accomplishing the purpose of allowing

lateral motion while transmitting rotary motion could be substituted for the preferred key/keyway combination.

As best seen in Figure 9, fixed gear 136 is also mounted on shaft 150 but, in contrast to follower gear 152, fixed gear 136 does not move laterally with respect to the tools 140 in converting station 134. Fixed gear 136 transfers rotary motion from the shaft 150 to the tools 140 which are operatively linked to fixed gear 136.

Converting station 134 includes a means for moving the follower gear 152 laterally with respect to helical main gear 144. As best seen in Figures 9 and 10, in the preferred embodiment follower gear 152 is moved axially using a truck 158 which partially surrounds helical follower gear 152. Truck 158 is slidably mounted on rods 160 and 161 and includes a threaded bore therethrough for accepting a threaded shaft 154. By rotating threaded shaft 154 (via turn crank 142 in the preferred embodiment), truck 158 and follower gear 152 can be moved laterally (i.e., in the axial direction) across the threaded shaft 154 and rods 160 and 161. Slide rods 160 and 161 help to maintain proper positioning of truck 158 as it moves horizontally (in a direction substantially parallel to shaft 150 and axle 148).

Although a truck 158 is disclosed as the preferred embodiment for imparting axial motion to follower gear 152, those skilled in the art will appreciate that any means for moving follower gear 152 in the axial direction can be substituted.

That relative lateral movement in the axial direction between the helical main gear 144 and follower gear 152 causes a corresponding change in the relative angular positioning between the follower gear 152 and helical main gear 144 due to the angled orientation of the teeth on main gear 144.

Figures 11A and 11B schematically depict the effect of moving follower gear 152 across the face of main gear 144. In Figure 11A, follower gear

152 and main gear 144 are in one orientation wherein point A on the circumference of follower gear 152 is aligned with a corresponding point A on the circumference of main gear 144. In Figure 11B, the follower gear 152 can be visualized as having been moved into the page, i.e., away from the viewer. As a result point A on the circumference of follower gear 152 is now offset from point A on follower main gear 144. Any rolls driven by follower gear 152 would also be rotationally offset from their original relationship to main gear 144.

By moving follower gear 152 across the face of main gear 144, the relative rotational positions of the two gears can be adjusted. Because main gear 144 rotates in synchrony with the central process drum 122 (and any web threaded over the drum) and follower gear 152 is used to rotate a driven roll in a converting station, the relative angular relationship between the process drum 122 and any roll driven by follower gear 152 is also adjusted by changing the relative angular relationship between the main gear 144 and follower gear 152.

The amount of adjustment available between any main gear 144 and follower gear 152 depends upon the width of the face of the main gear 144 as well as the helix angle of the teeth on that main gear 144. Figure 12 is a schematic representation of a portion of the face of the preferred main gear 144. The axial direction is represented by axis Z while the helix angle is indicated as θ . The distance R is the circumferential difference traveled by a given gear tooth along the circumference of main gear 144. The distance F is the width of the face of main gear 44. When the helix angle θ and the width of gear face F are known, the distance R can be calculated according to the equation below:

$$R = F(\tan \theta)$$

As a result, the helix angle chosen for the main gear 144 and accompanying follower gear 152 can be chosen to provide the desired amount of registration adjustment. It will be understood that if a greater or lesser amount of

rotational adjustment is required, the width of the gear face and/or the helix angle can be adjusted as required. In one preferred embodiment, the main gear 144 has a 4" (10.1cm) face, follower gear 152 has a 1" (2.54cm) face, and both have a helix angle of 26° relative to the axial direction. It will be understood that any suitable
5 face dimensions and helix angle can be substituted.

As indicated above, the present invention is particularly well suited to convert materials formed using webs which are elastic and/or delicate. Such webs must typically be converted at tension levels which are at or near zero to prevent web breaks and/or puckering due to tension variations in the final product.
10 One product which requires control over tension in the converting process are ACTIVE STRIPS, manufactured by Minnesota Mining and Manufacturing Company, St. Paul, Minnesota. Other examples of webs which exhibit elastic and/or delicate properties are elastic nonwoven tapes such as, for example, those described in U.S. Patent Nos. 4,366,814 and 5,230,701. One skilled in the art of
15 converting will understand that many other web materials which must be converted could be advantageously used with the converting machine according to the present invention.

A representative sample of an ACTIVE STRIP, a self-adhesive bandage, is depicted in Figures 13 and 14. The bandage 178 includes a substrate
20 layer 180 which is elastic. In the preferred embodiment the substrate 180 is manufactured from a microporous foam pressure sensitive adhesive tape marketed under the trademark MICROFOAM by Minnesota Mining and Manufacturing Company of St. Paul, Minnesota. The MICROFOAM backing consists of a controlled density polyvinyl chloride chemically blown foam and the preferred
25 adhesive is an acrylic pressure sensitive adhesive.

Bandage 178 includes a layer 182 of pressure-sensitive adhesive which is, in the most preferred embodiment, bio-compatible. The bandage 178 also

preferably includes an absorbent pad 184 designed to absorb wound exudates such as blood and other fluids. The preferred pads 184 are manufactured from an absorbent fibrous foam or hydrogel pad. Examples of suitable pad materials include gauze and MICROPAD, an absorbent foam pad material marketed by Minnesota Mining and Manufacturing Company of St. Paul, Minnesota. Those skilled in the art will understand that many other absorbent materials could be used to provide pads 184.

The bandage 178 also preferably includes two liners to protect both the adhesive layer 182 as well as pad 184 from contamination before use. The bottom liner 188 is provided on one side of the bandage 178 and a top liner 186 is provided on the opposite side of the bandage 178. The top liner 186 partially overlies the bottom liner 188 to provide the desired level of protection for pad 184. In addition, in some embodiments the bandage 178 can be provided with a bottom liner 188 which includes a J-fold to facilitate liner removal without contacting the pad 184 and such a fold will be well known to those skilled in the art.

As indicated above, the rotary drum converter 120 of the present invention is particularly well-adapted to produce products such as the bandages 178 depicted in Figure 13 and 14. The bandages 178 are preferably produced in a web 190 which is depicted in cross section in Figure 15 before being converted by a sheeting die into the actual bandages 178. The preferred web 190 is formed to produce bandages 178 in a "two-up" configuration, i.e., two bandages are produced adjacent to each other in the transverse web direction. As a result, a single top liner 186 is provided in the center of the web 190 while two bottom liners 188a and 188b (referred to collectively as 188) are provided on either side of the web 190.

As shown in the cross sectional view of Figure 15, the web 190 includes substrate 180 which is elastic, adhesive layer 182 attached to substrate 180 and a pair of pads 184 attached to the adhesive 182. In the center of web 190, top

liner 186 is attached to the adhesive layer 182 as well as lying over at least a portion of pads 184 and each of the bottom liners 188. Two separate bottom liners 188a and 188b are also attached to the outer edges of adhesive 182 and also lie over pads 184 as shown.

5 Although the cross-sectional view shown in Figure 15 depicts pads 184, it will be understood that at least portions of web 190 do not include pads 184 as there is preferably a space between the edges of pads 184 and the edges of each bandage 178 as best seen in Figure 13.

Figure 16 depicts a thread-up diagram of one embodiment of a
10 rotary drum converter according to the present invention for producing a web 190 as depicted in Figure 15. In accordance with the present invention, all of the converting activities occur around central process drum 122 which is rotating in the direction shown. The converting operations can be separated into three stations indicated as D, E and F located around the circumference of process drum 122.

15 Converting begins with substrate 180 which is threaded between process drum 122 and nip roll 1100. In the preferred embodiment, nip roll 1100 is driven to ensure that it is rotating at the same speed as process drum 122. In the preferred method, substrate 180 is provided with adhesive 182 and a liner 181. The liner must be removed from adhesive layer 182 to allow the attachment of pads 184
20 as well as product liners 186 and 188 as described above.

Due to the elastic nature of substrate 180 as described above, removal of the liner 181 is preferably accomplished at converting station D using a knife edge 1102 to isolate the zone in which liner 181 releases from adhesive 182. In the preferred embodiment, liner 181 is threaded through a driven nip formed by
25 rolls 1106 and 1104, one of which is preferably an elastomeric roll and the other of which is preferably knurled to provide a positive grip on liner 181. It is preferred that one of nip rolls 1104 or 1106 is driven ultimately by main gear 144 to match

the speed of the liner 181 with the speed of web 80. As a result, removal of liner 181 does not induce tension into substrate 80 which would be highly undesirable. The liner 181 is collected on a rewind as shown in Figure 16.

5 The actual implementation of knife edge 1102 and nip rolls 1104 and 1106 will be well known to those skilled in the art and will not be described in detail herein.

At the next converting station, i.e., Station E, the material for pads 184 is provided and attached to the adhesive surface 182 on substrate 180. That process is accomplished through the use of a three roll stack using rolls 1108, 1110
10 and 1112.

Roll 1108 is preferably an elastomeric roll which pulls the web 183 from its unwind through the nip formed by roll 1108 and anvil roll 1110. Anvil roll 1110 forms a nip with roll 1108 and also preferably acts as a surface against which die roll 1112 acts to cut pads 184 from two webs 183 which provide the material
15 for pads 184. In the preferred embodiment, two rows of pads 184 are placed on web 180 to form the "two-up" bandages described above. To reduce waste it is preferable to supply two webs 183, each of which is used to form one row of pads 184.

In the preferred embodiment both anvil roll 1110 and die roll 1112
20 are driven from main gear 144 according to the principles of the present invention. As a result, their speed is precisely matched with the speed of the central process drum 122.

Figure 17 depicts an enlarged view of the converting station E depicted in Figure 17. As shown there a guide 1113 is located between anvil roll 1110 die roll 1112 and central process drum 122. The guide 1113 is formed to
25 guide the movement of the individual pads 184 after they have been removed from the web 183 and before they have been applied to the adhesive on substrate 180.

Guide 1113 does so because its shape matches the radius of the die roll 1112 to help retain pads 184 in die cavities 1111 on die roll 1112 (die cavities are not depicted in Figure 17 for clarity, refer to Figure 18) after they have been formed from webs 83.

5 The die cavities 1111 shown in Figure 18 are preferably lined with a resilient material to assist in transferring pads 184 to the adhesive on substrate 180. The resilient material also ensures that pads 184 release from die cavities 1111 and die roll 1112. Alternate methods of forming and/or placing pads 184 will be well known to those skilled in the art. Examples include using a vacuum system within
10 cavities 1111 to retain the cut pads 184 until placement, or a pick and place apparatus could be used to place pre-formed pads 184 on the substrate 180.

 The portions of webs 183 remaining after the pads 184 have been removed are indicated by reference number 185 and are commonly referred to as weeds. The weeds 185 are preferably collected on a rewind stand as shown in
15 Figure 16 and are later recycled or discarded.

 In the most preferred embodiment, the action of converting station E in forming pads 184 is preferably discrete as opposed to continuous. Those skilled in the art will understand the use of clutch mechanisms which advance webs 183 as needed to apply pads 184 at spaced locations along a substrate 180. In such a
20 process, the amount of weed material 185 can be reduced because no material would remain between adjacent pads 184 (in the web travel direction) if this mechanism were used, i.e., the web 183 would advance in discrete steps equal to the length of a pad 184 in the web travel direction.

 Turning now to Figure 19, the thread-up for the top liner 186 and
25 bottom liners 188a and 188b is shown as enlarged from the view seen in Figure 16. Substrate 180 is located on process drum 122 (it will be understood with adhesive sides 182 out) and rotating in the direction shown. Substrate 180 includes pads 184

attached to adhesive surface 182 as described above at Station D. Bottom liners 188a and 188b and top liner 186 are threaded between a nip roll 1114 and process drum 122 where they contact the adhesive 182 on substrate 180. By applying pressure at that nip, the webs are joined together to form web 190 as depicted in the cross-sectional view of Figure 15.

Nip roll 1114 is preferably a resilient roll, such as a silicone rubber, having an appropriate durometer. The actual choice of roll material and, if an elastomer, the durometer, will be well known to those skilled in the art.

In the preferred embodiment, nip roll 1114 is preferably driven by a series of gears which are ultimately driven by main gear 144 in accordance with the principles according to the present invention. As a result, the speed of nip roll 196 precisely matches the speed of process drum 122, thereby preventing overdriving or underdriving of nip roll 1114 which could induce tension into the web 190.

Returning now to Figure 16, top and bottom liners 186 and 188a and 188b are threaded between a driven nip roll 1114 and central process drum 122. To further prevent tension in the substrate 180, bottom liners 188a and 188b are preferably unwound from an unwind stand which allows for independent rotation of each of rolls 188a and 188b.

A schematic diagram of one preferred unwind stand is depicted in Figure 20 and includes a shaft 1130 which includes two sections 1132 and 1134 each of which rotate independently. Section 1132 is mounted for rotation on an axle and includes a shank portion (not shown) on which section 1134 is mounted for independent rotation. The rotation of each section 1132 and 1134 is operatively connected to a separate braking unit which independently controls tension of each of the webs 188a and 188b.

After top and bottom liners 186 and 188 have been added to web 1190 the web is threaded between a nip formed between a sheeting die 1116 and central process drum 122. In the preferred embodiment, sheeting die 1116 includes
5 a two-up die cavity design which includes die cavities 1117 as shown in Figure 21. The actual spacing of cavities 1117 should be matched with the spacing between cavities 1111 and die roll 1112 used to form and place pads 184 in web 190.

In addition to the tension control useful for converting a product from an elastic substrate such as that described above, the registration control
10 abilities of the present invention are also particularly useful when converting bandage type products as described herein. The registration between die cavities 1117 on sheeting die 1116 with die cavities 1111 on die roll 1112 is essential to produce bandages 178 as described in Figures 13 and 14. Pad 184 must be centered in the bandage 178 and, as a result, sheeting die 1116 must be registered
15 with respect to the placement of pads 184 to achieve that result. In the preferred embodiment, sheeting die 1116 is driven from main gear 44 using a follower gear 152 as described above to achieve that registration. It will be understood, however, that either sheeting die 1116 or pad die 1111 could be capable of registration adjustment in accordance with the principles of the present invention.

20 In the preferred process an additional nip roll 1118 is provided to form a nip with central process drum 122 to isolate tension from the rewind stand 189 which rewinds the weed from the sheeting process performed using sheeting die 1116. It is preferred that nip roll 1118 is driven to ensure precise speed control to prevent inducing tension into web 190. In some instances, it is also helpful to
25 separate bandages 178 from the weed by wrapping the weed around a relatively small diameter roll.

In one preferred process bandages 178 are then collected in bin 1122 using sheet 1120 as shown. It is also envisioned that bandages 178 may be introduced directly into a packaging system in line with the converting machine to further enhance production of bandages 178 using a machine according to the present invention. The integration of such equipment will be well known to those skilled in the art and will not be described herein.

Figure 22 is a schematic diagram depicting a variety of side plates used in converting stations which can be attached to a rotary drum converter 122 according to the present invention. Station G includes side plates which are particularly adapted for converting stations in which a die roll will be acting against a separate anvil roll as opposed to the central process drum.

Side plates 1150 include slots 1152 and 1154 for accepting blocks on which the desired rolls are mounted. It is preferred that one of the slots 1152 be oriented substantially radially with respect to the central process drum while the other slot 1154 is located at an angle to a radial line extending from the central process drum. As a result, as rolls are advanced within each of slots 1152 and 1154 they will meet, thereby forming a desired nip point between, for example, an anvil roll and a die roll. One example of a station such as this is depicted as station E in Figure 16 where it is used to provide the die cutting process for forming pads 184 on bandages 178. In that example anvil roll 1110 and die roll 1112 are mounted in side plates similar to 1150 to provide the desired nip between anvil roll 1110 and die roll 1112.

Converting station H is an example of a "single" converting station in which a single slot 1162 is provided along with a single gear 138 which is driven ultimately from the main gear 144. As a result, a roll mounted in side plate 1160 can be driven from main gear 144 to provide both speed and registration control as described above.

Converting station I is provided with a side plate 1170 which includes two slots 1172 and 1174 for receiving rolls both of which are driven off a single gear 138g. Because both rolls mounted in slots 1172 and 1174 will be driven by a single gear 138g, it will be understood that no registration control can be
5 achieved between those two rolls. Rather, as described above, registration is achieved between stations which operate on separate gears 138 which are attached to separate follower gears 152 along the lines discussed above.

The converting stations described in Figure 22 are only a few examples of converting stations which can be used around a central process drum
10 122 in accordance with the principles of the present invention and the invention should not limited to the specific examples described herein.

We Claim:

1. A mechanism for supporting at least two rolls of indefinite length substrate, comprising:
 - 5 a shaft having a first end and a second end;
 - a first spindle, comprising a mounting portion and a shank portion, said mounting portion adapted to support a roll of indefinite length substrate, said first spindle being rotatably mounted on said shaft such that said mounting portion is proximate said second end of said shaft and said shank portion is proximate said
 - 10 first end of said shaft;
 - means for controlling the rotation of said first spindle about said shaft, said rotation controlling means being located proximate said first end of said shaft;
 - a second spindle adapted to support a roll of indefinite length substrate rotatably mounted on said shank portion of said first spindle; and
 - 15 means for controlling the rotation of said second spindle about said shank portion, said second spindle rotation controlling means being located proximate said first end of said shaft.
2. The mechanism of claim 1 wherein said means for controlling the
- 20 rotation of said first spindle and said means for controlling the rotation of said second spindle each comprise an independently controlled brake.
3. The mechanism of claim 2 wherein said brake comprises a disc brake
- 25 assembly.
4. The mechanism of claim 1 wherein said means for controlling the
- rotation of said first spindle and said means for controlling the rotation of said
- second spindle each comprise a motor adapted to independently apply torque to
- said first and said second spindles.

30

5. The mechanism of claim 1 wherein the first end of the shaft is mounted to a support.

6. A mechanism for supporting at least two rolls of indefinite length substrate, comprising:
5 a shaft having a first end and a second end;
a first spindle, comprising a mounting portion and a shank portion, said mounting portion adapted to support a roll of indefinite length substrate, said first spindle being rotatably mounted on said shaft such that said mounting portion is proximate said second end of said shaft and said shank portion is proximate said first end of said shaft;
10 a brake assembly to control rotation of said first spindle about said shaft, said brake assembly being located proximate said first end of said shaft;
a second spindle adapted to support a roll of indefinite length substrate rotatably mounted on said shank portion of said first spindle; and
15 a brake assembly controlling the rotation of said second spindle about said shank portion, said second brake assembly located proximate said first end of said shaft.

7. The mechanism of claim 6 wherein said brake assembly comprises a disc brake assembly.

8. The mechanism of claim 6 wherein the first end of the shaft is mounted to a support.

25

9. A method of manufacturing wound dressings, comprising:
supporting at least two rolls of indefinite length substrate on a mechanism, the mechanism comprising a shaft having a first end and a second end;
a first spindle, comprising:

a mounting portion and a shank portion, said mounting portion adapted to support a roll, said first spindle rotatably mounted on said shaft such that said mounting portion is proximate said second end of said shaft and said shank portion is proximate said first end of said shaft;

5 controlling the rotation of said first spindle about said shaft with a first rotation controlling means, said rotation controlling means located proximate said first end of said shaft;

a second spindle adapted to support a roll rotatably mounted on said shank portion of said first spindle; and

10 controlling the rotation of said second spindle about said shank portion with a second rotation controlling means, said second spindle rotation controlling means located proximate said first end of said shaft;

feeding said substrates into a converting operation which includes laminating and die cutting said substrate.

15

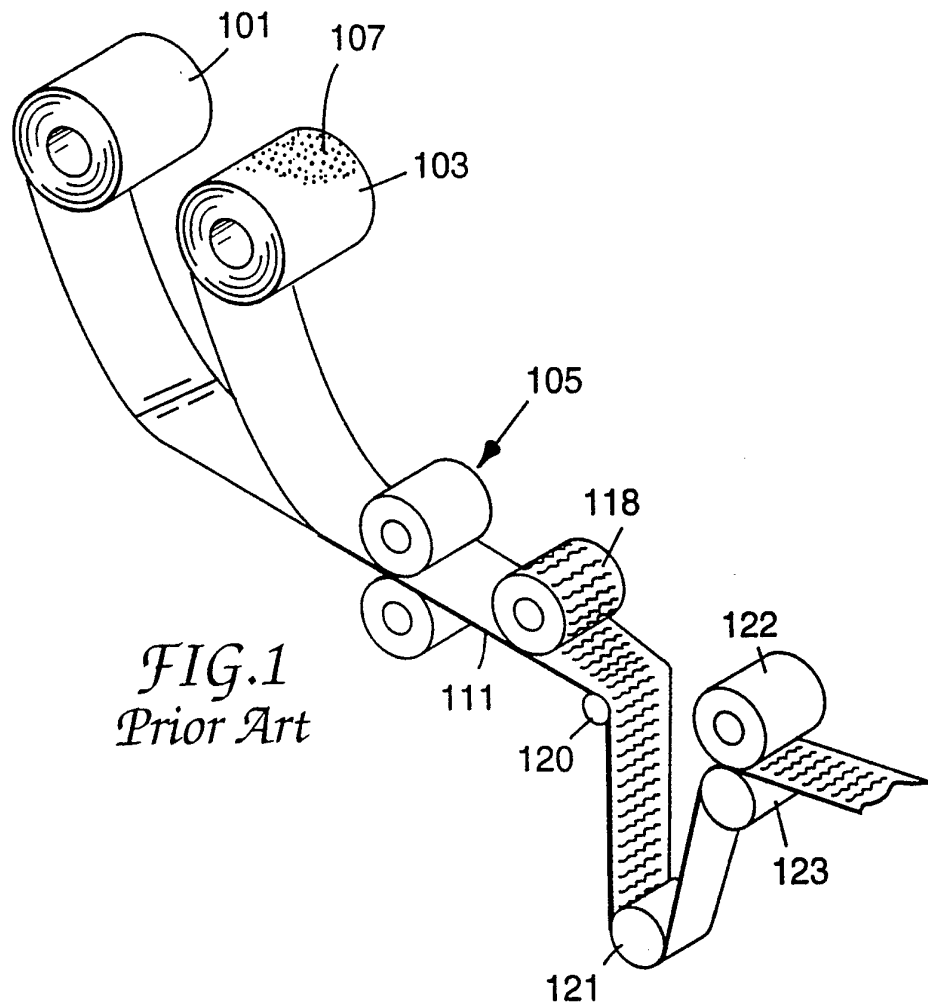
10. The method of claim 6 wherein said substrates comprise a film coated with an adhesive and a label stock.

11. The method of claim 6 wherein said step of controlling rotation of
20 said first and second spindles comprises independently controlling brakes to resist rotation of the first and second spindles.

12. A method of independently tensioning two or more webs supplied from two or more rolls of web stock for further processing, the method comprising:
25 providing a shaft having a first end and a second end, a first spindle having a mounting portion and a shank portion, and a second spindle;

rotatably mounting the first spindle on the shaft with the shank portion proximate the first end of the shaft and the mounting portion proximate the second end of the shaft;

- rotatably mounting the second spindle on the shank portion of the first spindle;
- mounting a first roll of web stock on the first spindle;
- mounting a second roll of web stock on the second spindle;
- 5 feeding the webs from the first and second rolls into converting apparatus;
- independently controlling rotation of the first and second spindles with a controller located proximate the first end of the shaft to independently control the tension of the webs fed from the first and second rolls.
- 10 13. A method according to claim 9 further comprising removing the first and second rolls of web stock from the first and second spindles without moving the controller.
14. A method according to claim 10 wherein the controller comprises a
- 15 first brake assembly adjacent the first end of the shaft, the first brake assembly being operatively connected to the shank portion of the first spindle, and a second brake assembly adjacent the first end of the shaft, the second brake assembly being operatively connected to the second spindle; the step of independently controlling rotation of the first and second spindles with a controller located proximate the first
- 20 end of the shaft to independently control the tension of the webs fed from the first and second rolls comprising:
- independently actuating the first and second brake assemblies to independently resist rotation of the first and second spindles.
- 25 15. A method according to claim 10 wherein the step of independently controlling rotation of the first and second spindles with a controller located proximate the first end of the shaft to independently control the tension of the webs feed from the first and second rolls comprising:
- independently driving the first and second spindles with a motor.
- 30



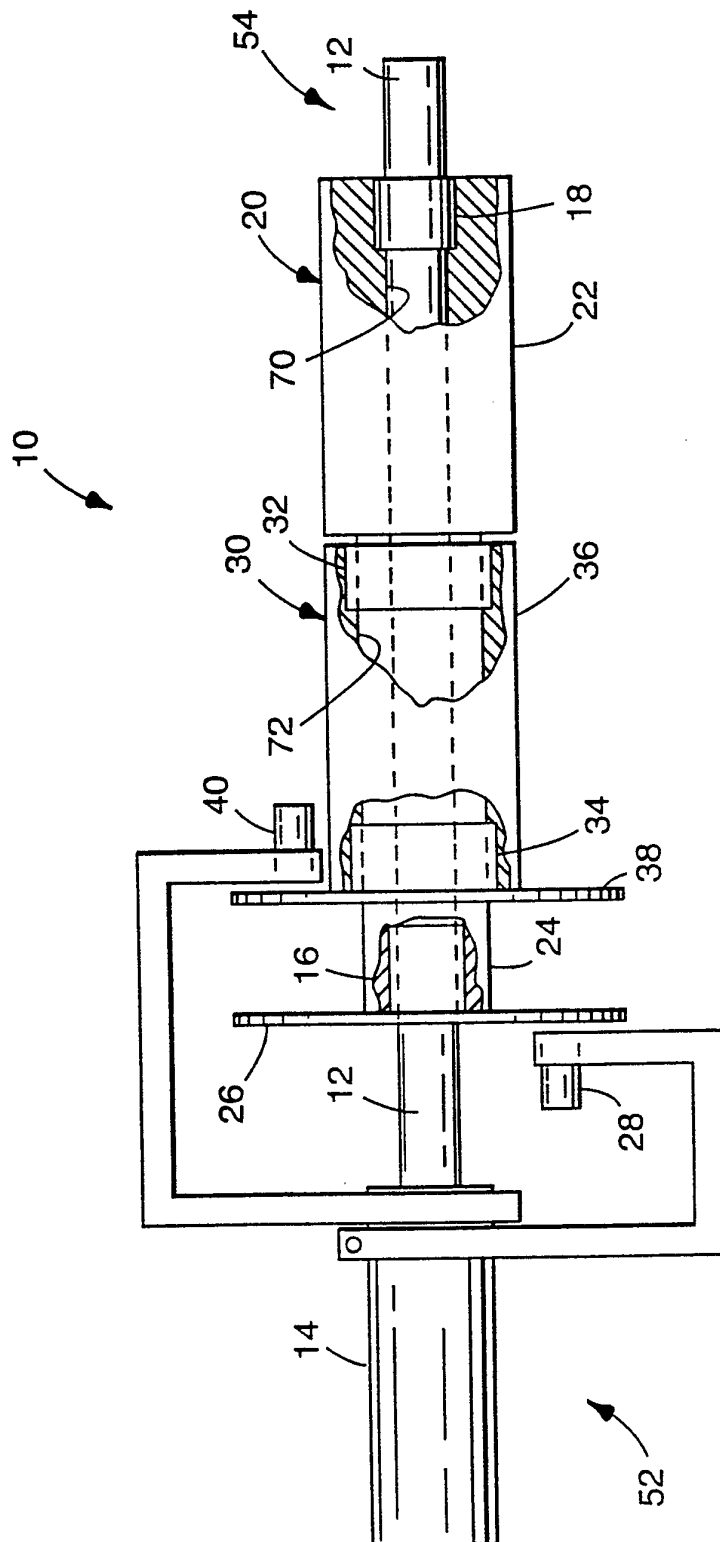


FIG. 2

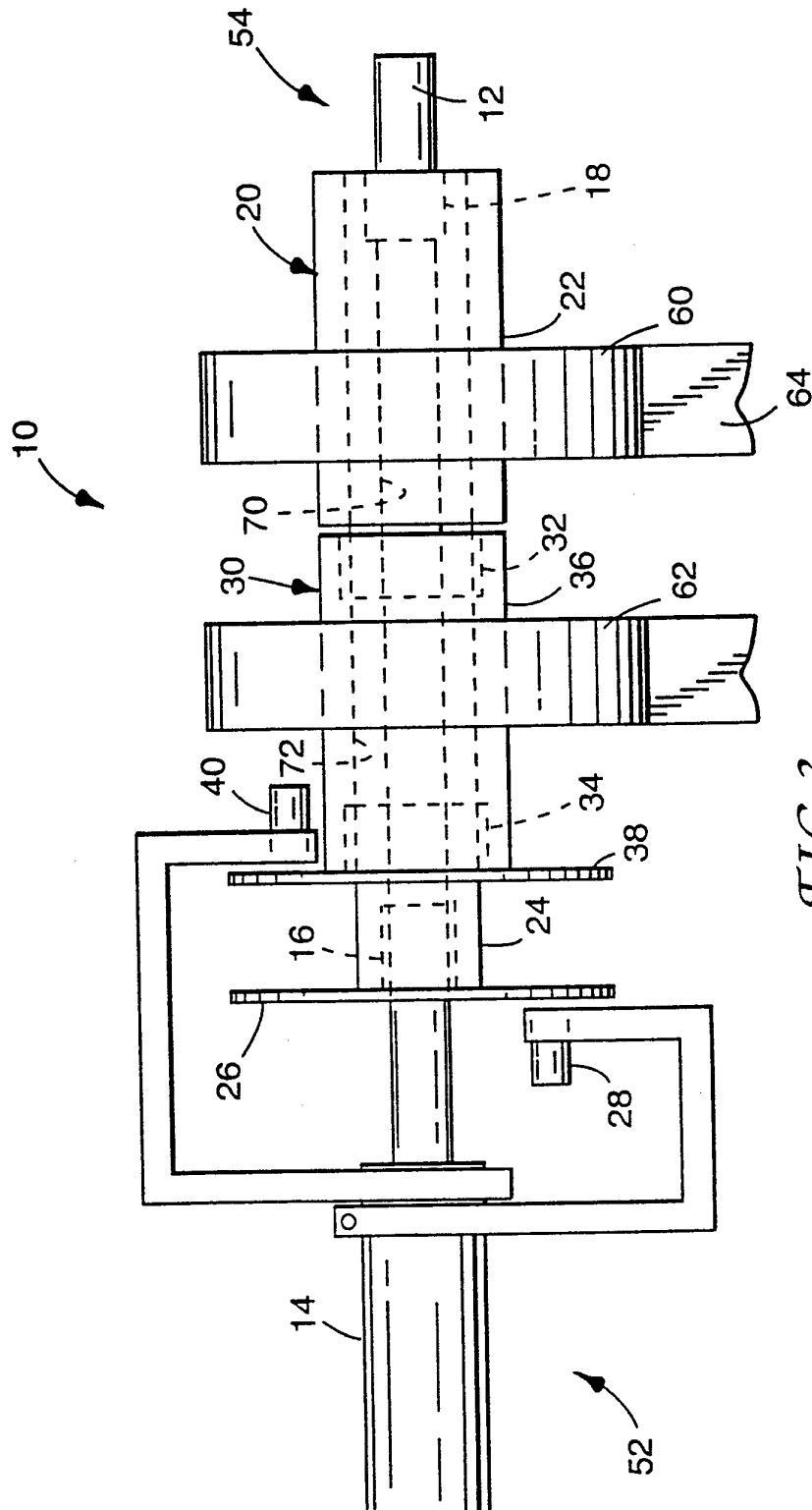
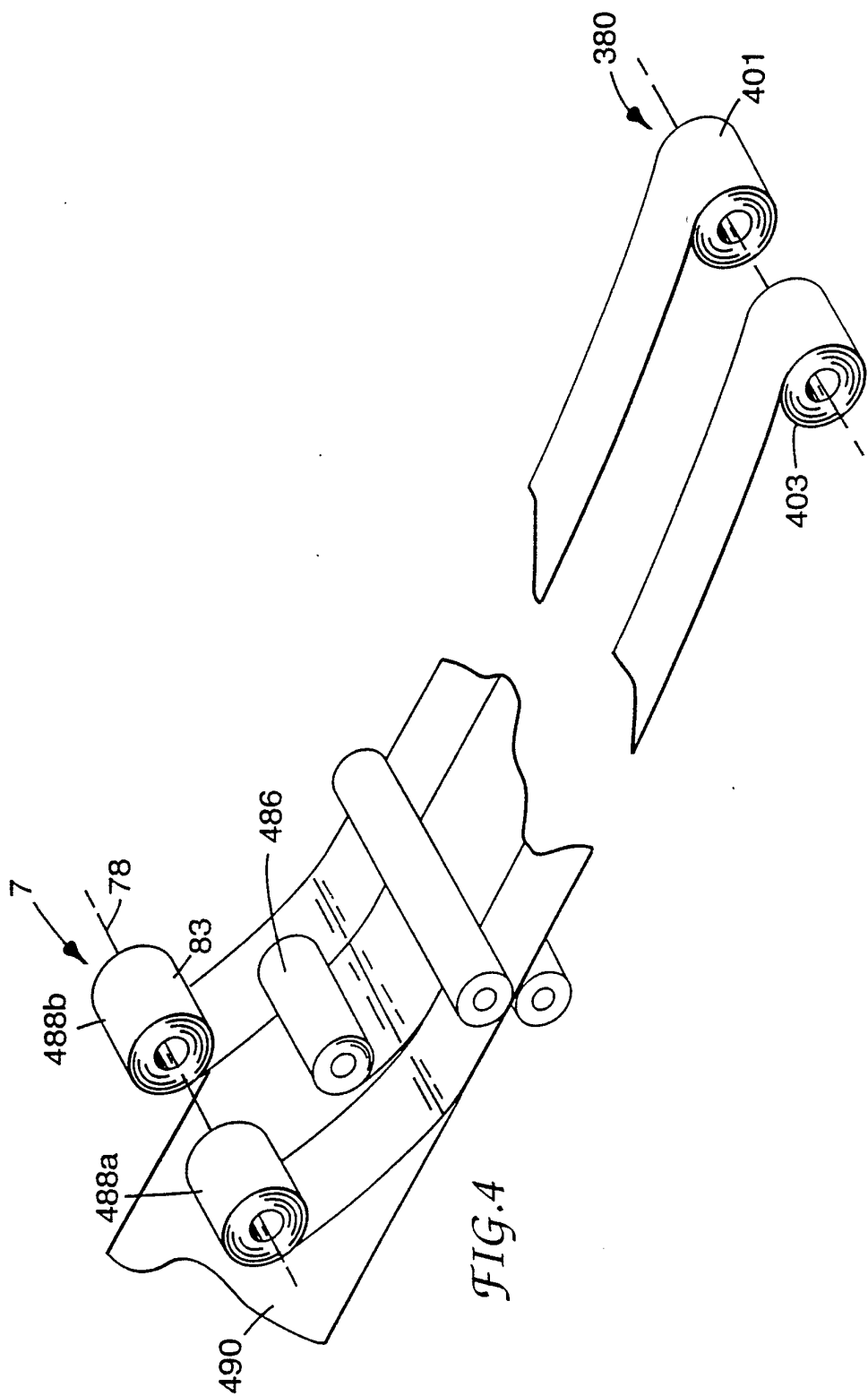


FIG. 3



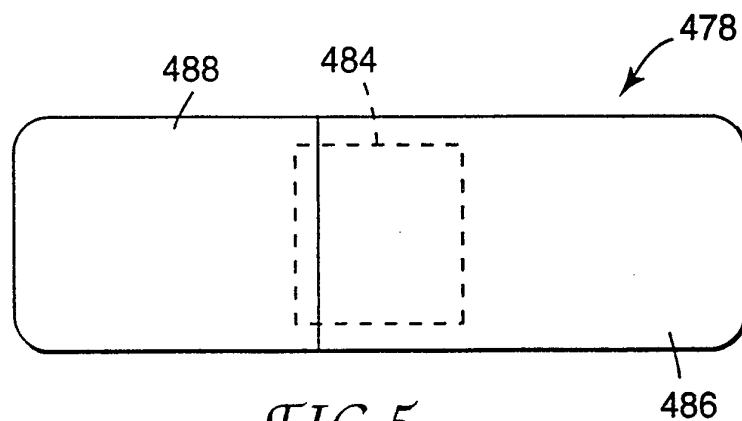
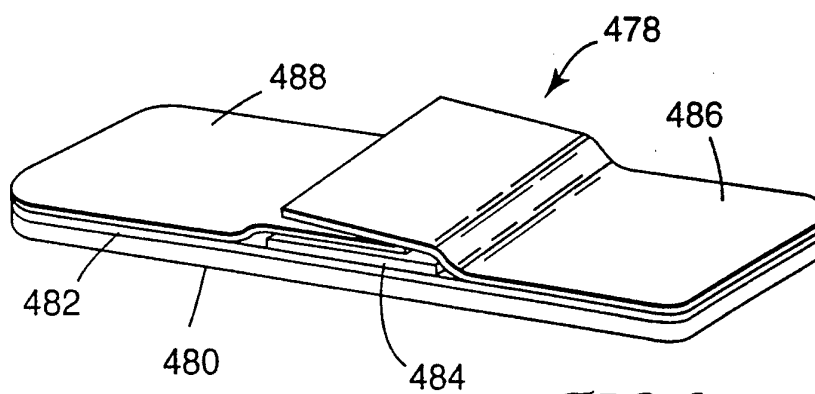
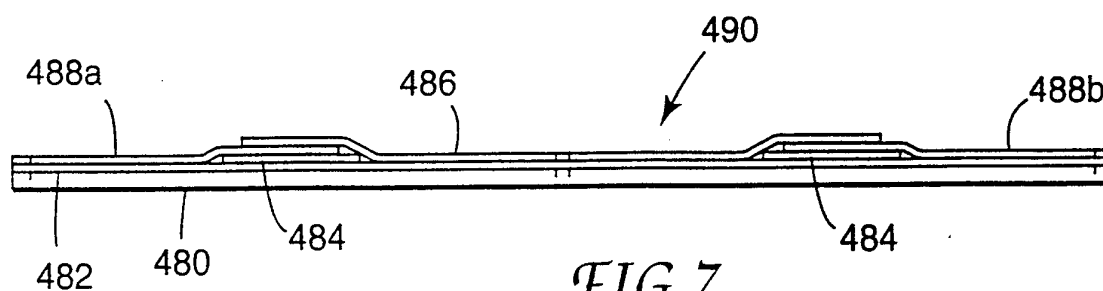
*FIG. 5**FIG. 6**FIG. 7*

FIG. 9

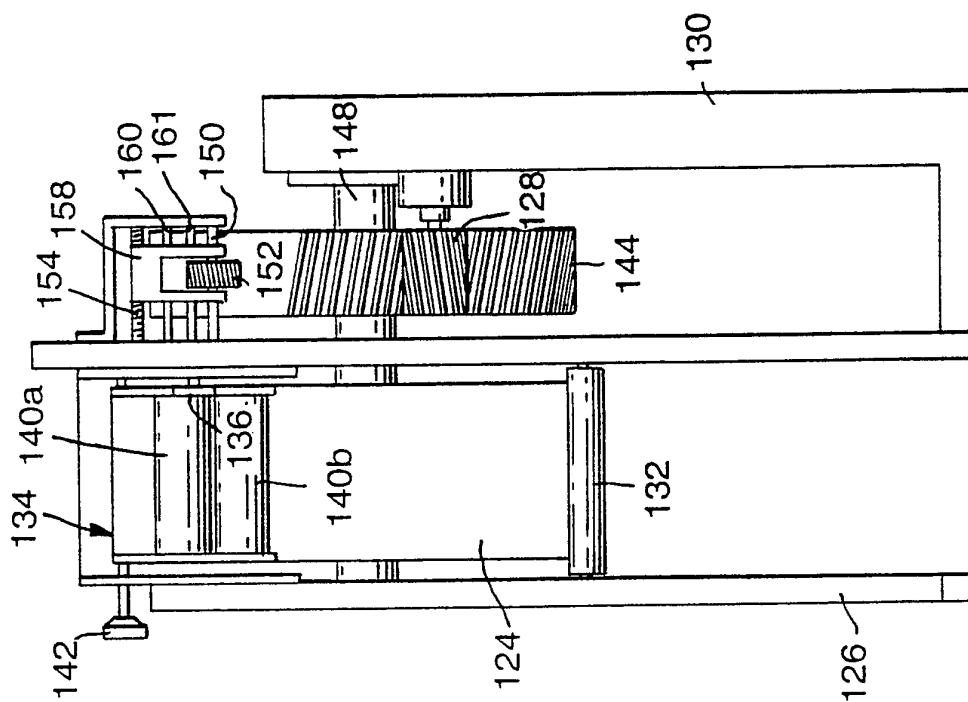
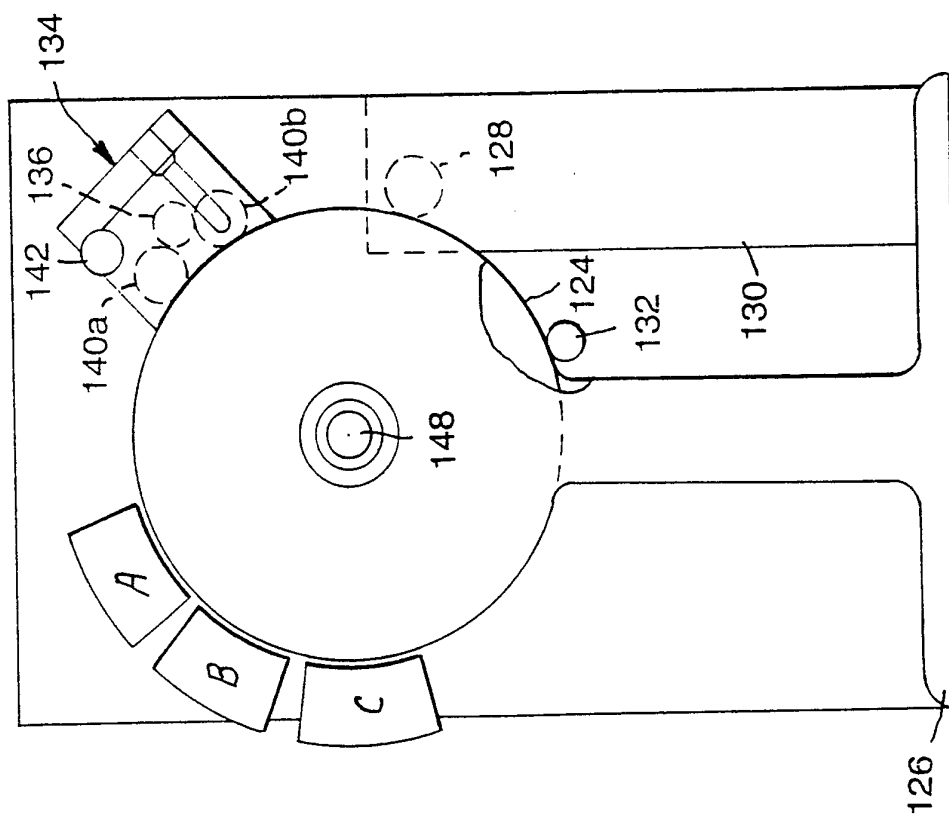


FIG. 8



7/12

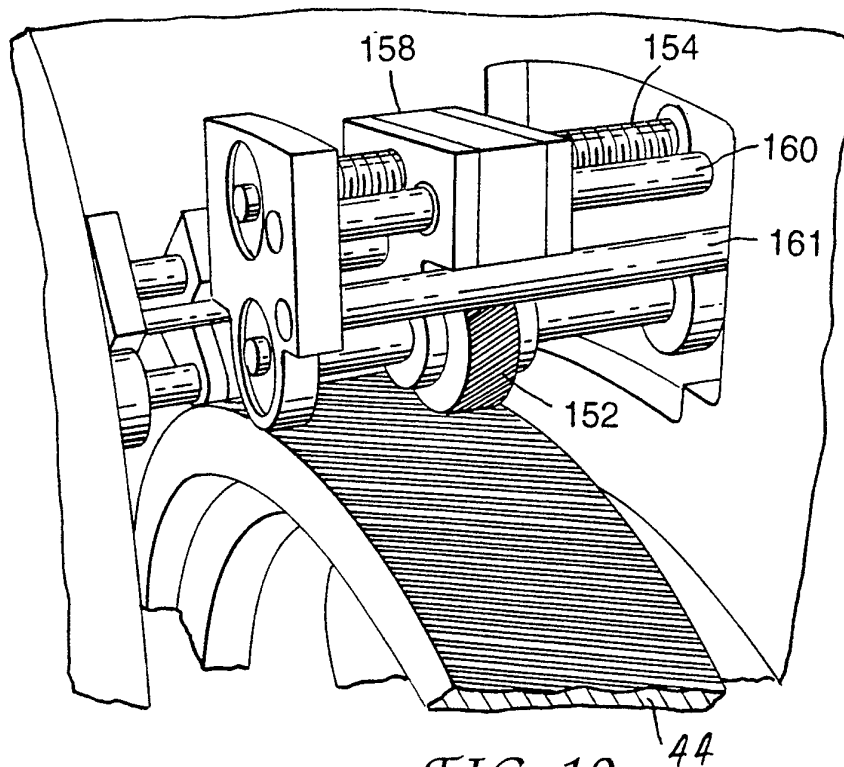


FIG. 10

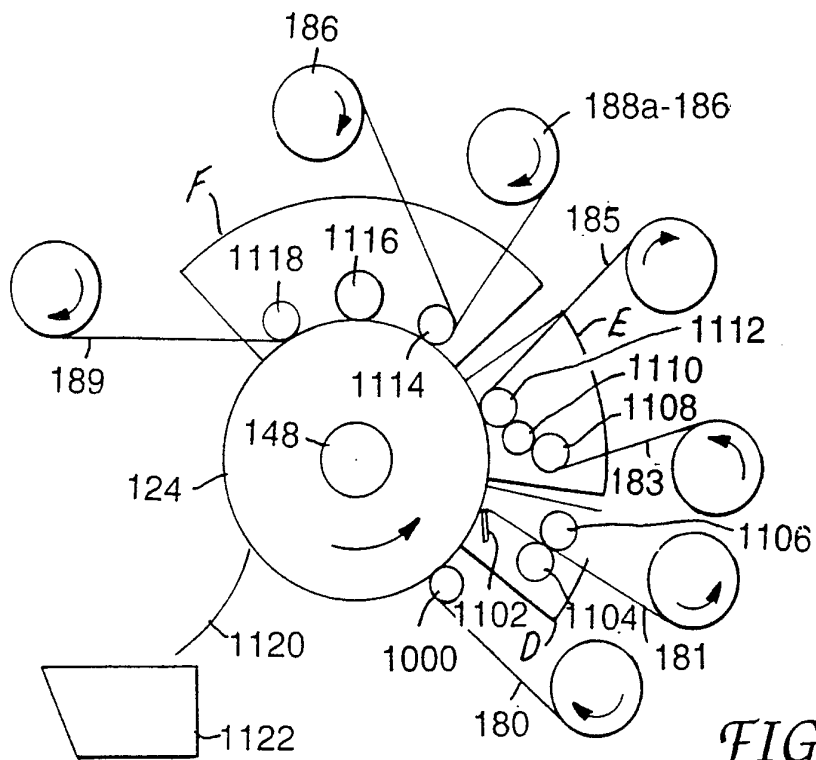


FIG. 16

8/12

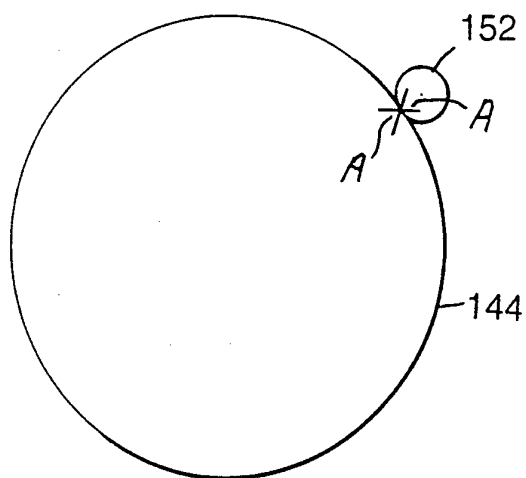


FIG. 11A

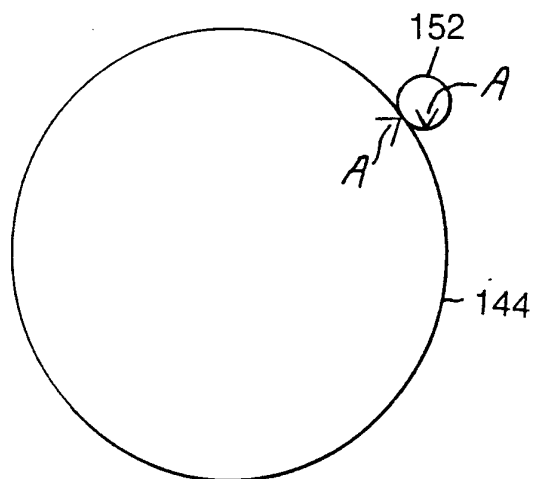


FIG. 11B

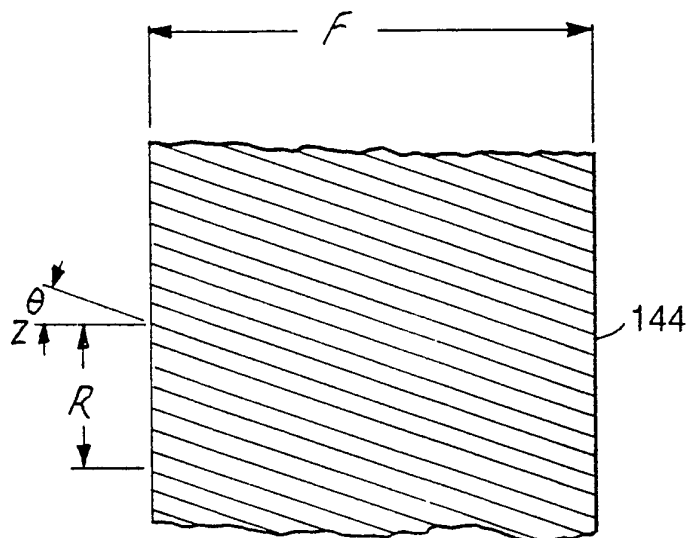
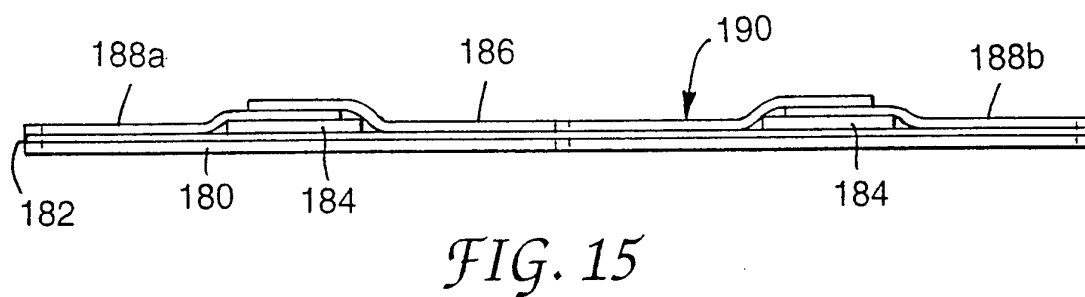
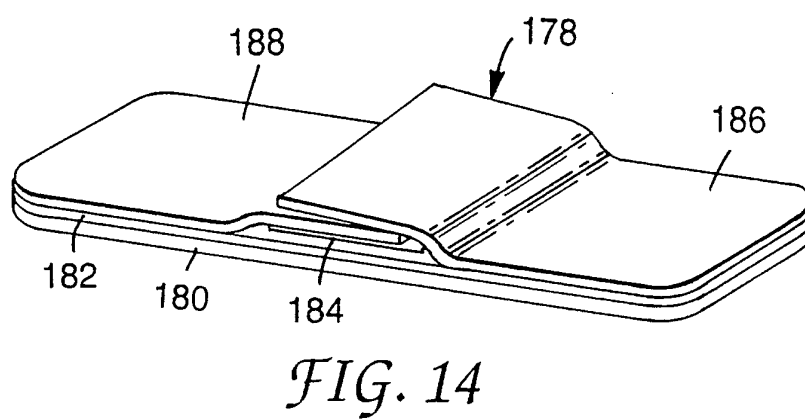
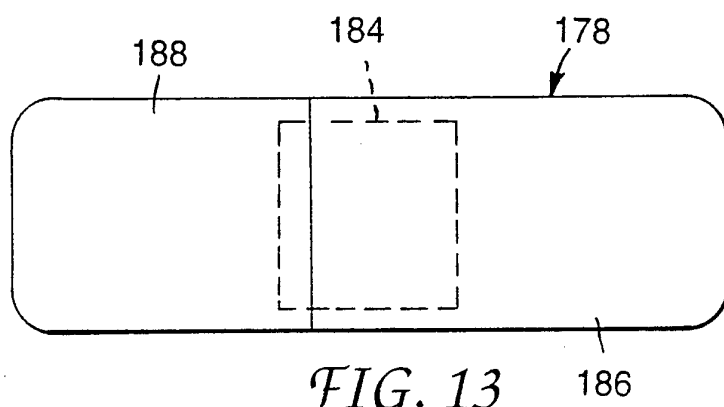
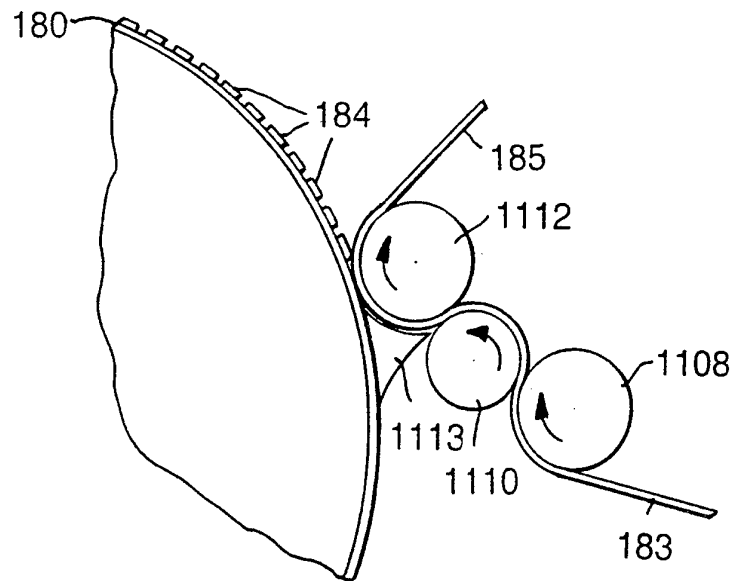
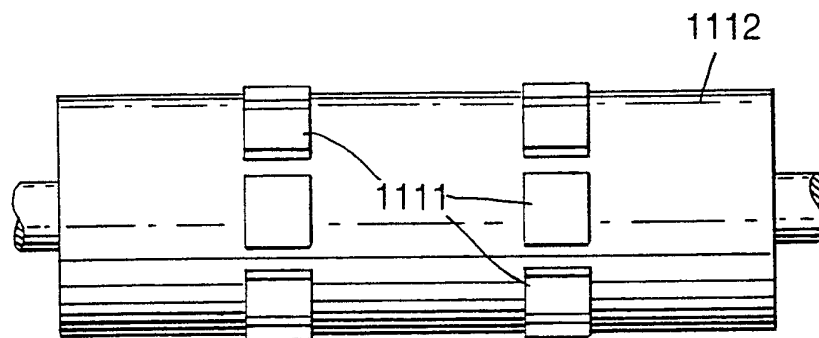
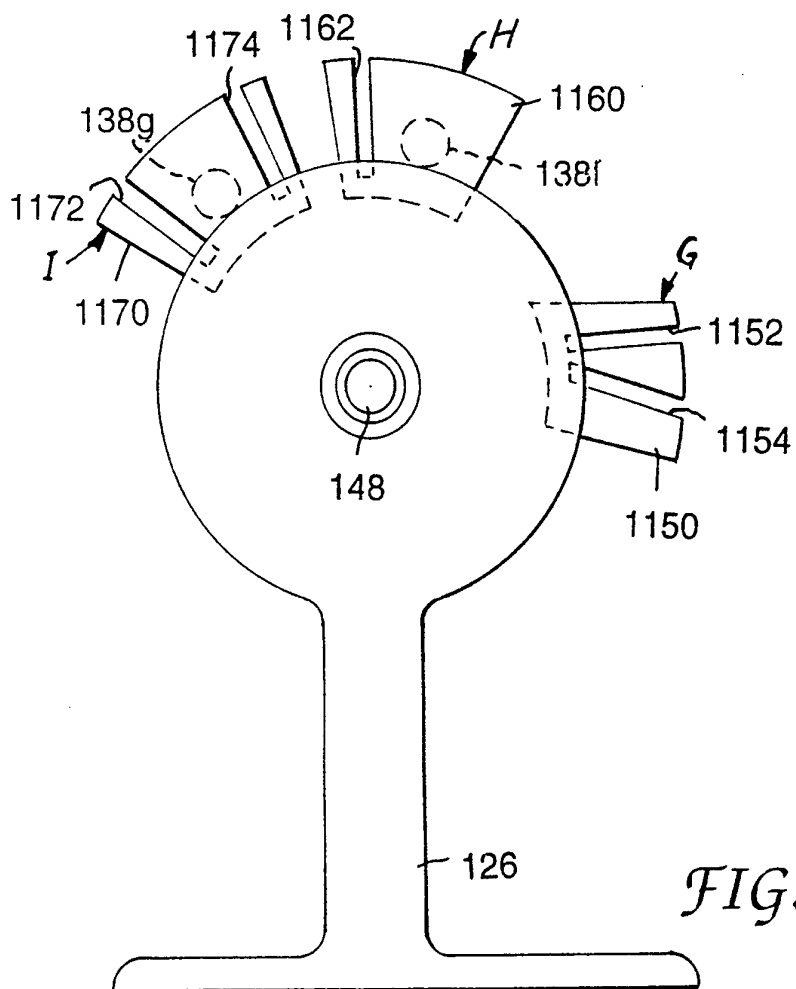
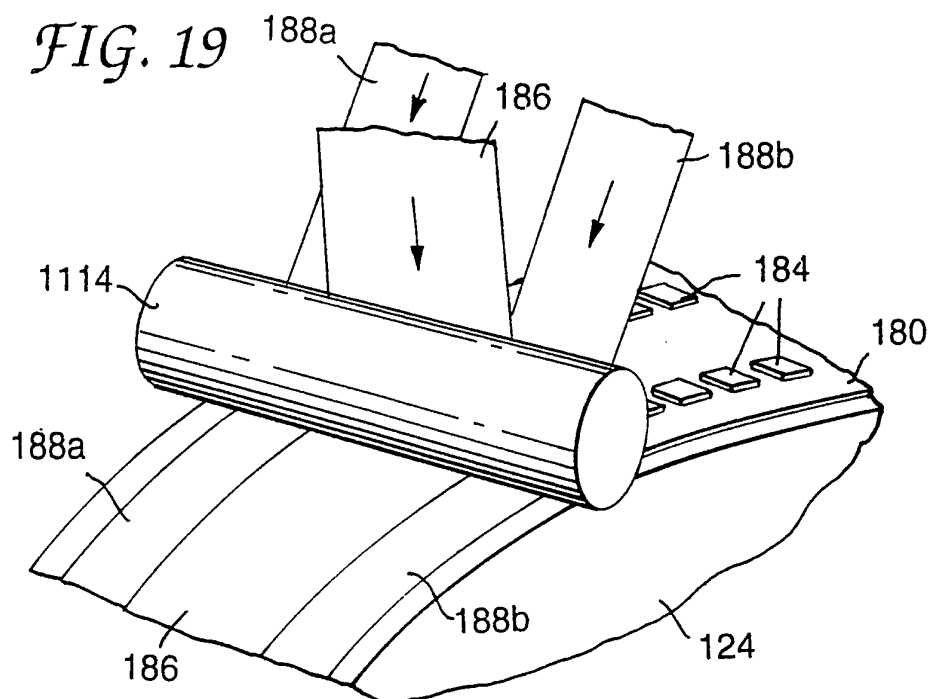


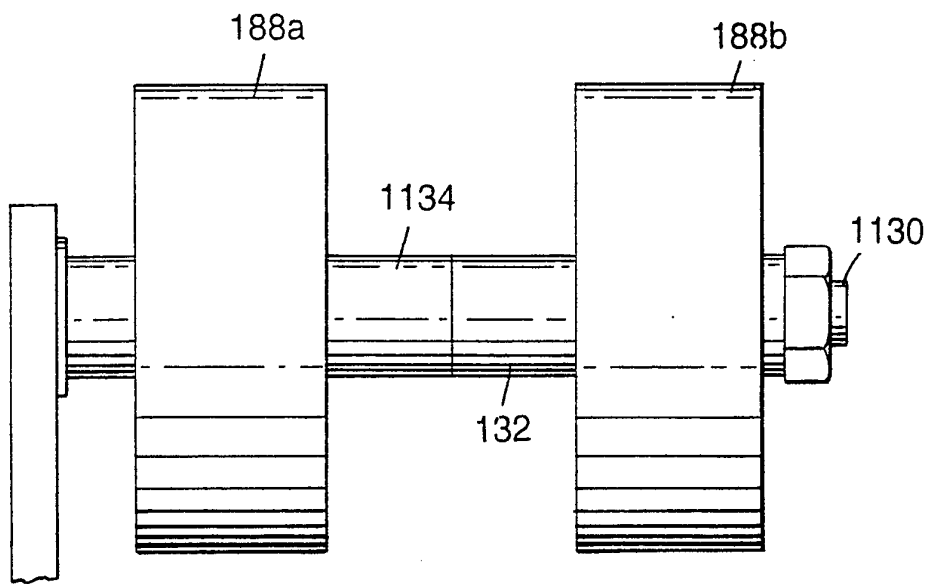
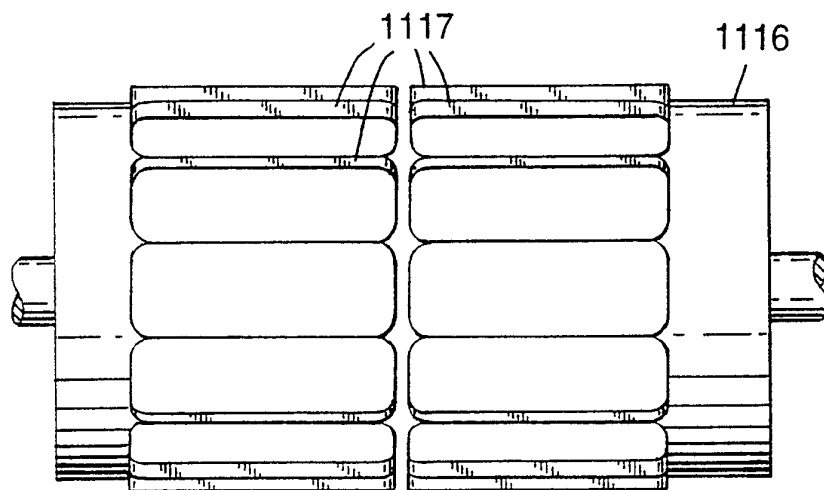
FIG. 12



*FIG. 17**FIG. 18*

11/12

FIG. 19*FIG. 22*

*FIG. 20**FIG. 21*