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Matsunaga

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(54) **SCRAP WINDER**

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B65H 54/58 (2006.01)
B26D 1/03 (2006.01)

(52) **U.S. Cl.**
CPC ***B26D 7/18*** (2013.01); ***B65H 54/585*** (2013.01); *B26D 1/035* (2013.01); *B65H 2701/37* (2013.01)

(58) **Field of Classification Search**
CPC B26D 7/18; B65H 54/585
USPC 242/525.3; 83/107
See application file for complete search history.

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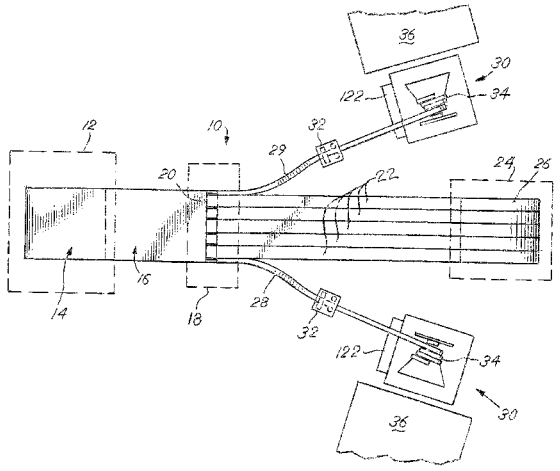
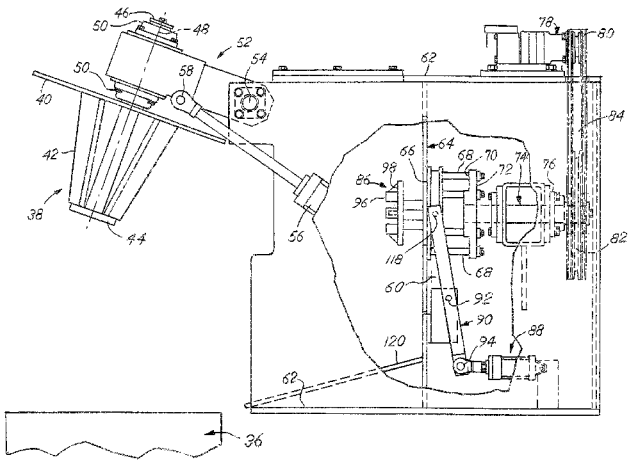
(57) **ABSTRACT**

A scrap winder is provided as part of a slitting line that creates a ribbon of scrap. The scrap winder has a moveable mandrel that exposes a grabbing portion that rotates. The grabbing portion extends outward to reveal a puller cable reel. The puller cable reel contains a retrieving cable that attaches to the start of the scrap ribbon. As the grabbing portion rotates, the scrap is brought to the grabbing portion, where the scrap is attached directly to it. The mandrel is then moved into position and the scrap can be wound around the mandrel.

19 Claims, 6 Drawing Sheets





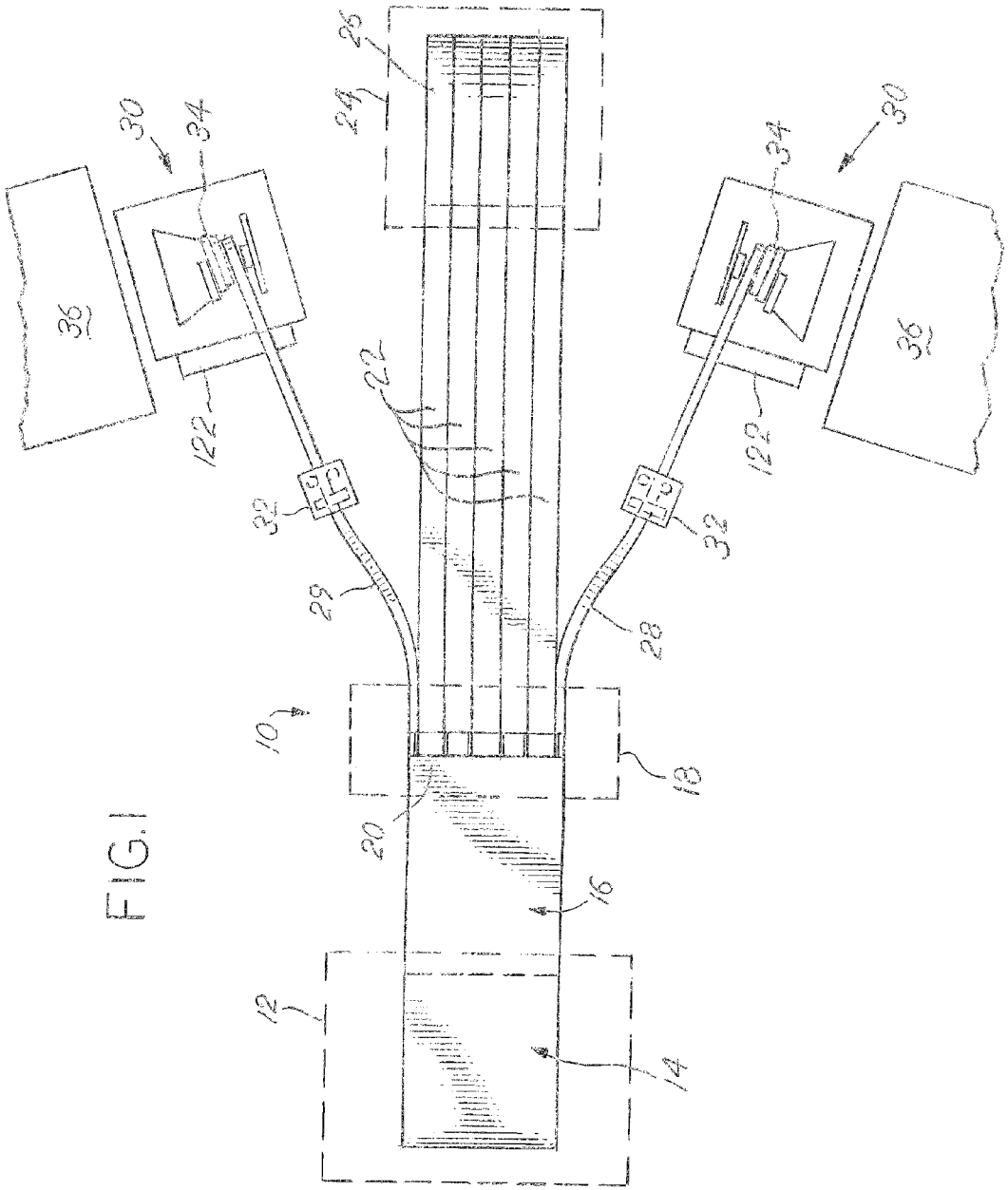


FIG. 1

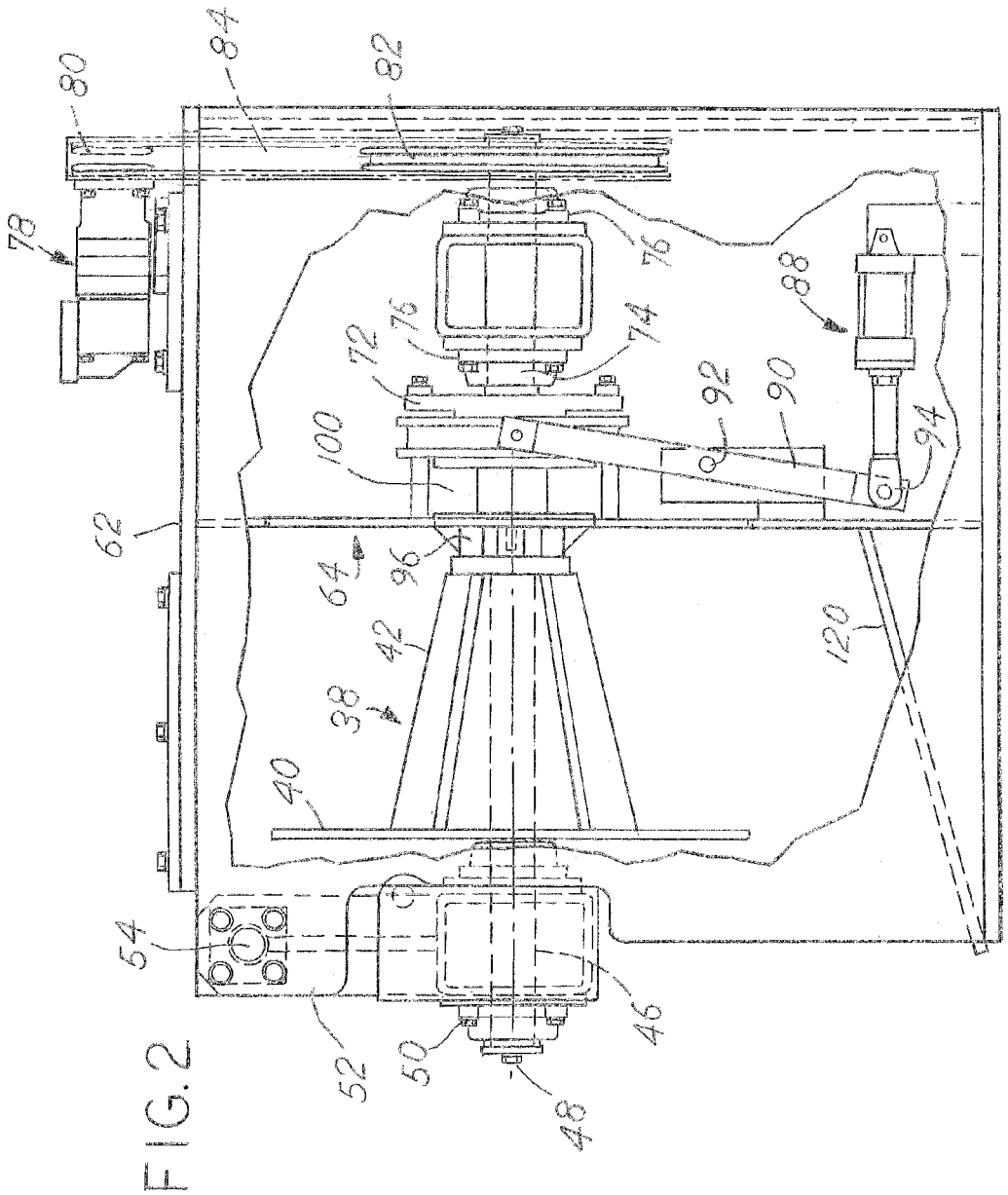

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FIG. 2

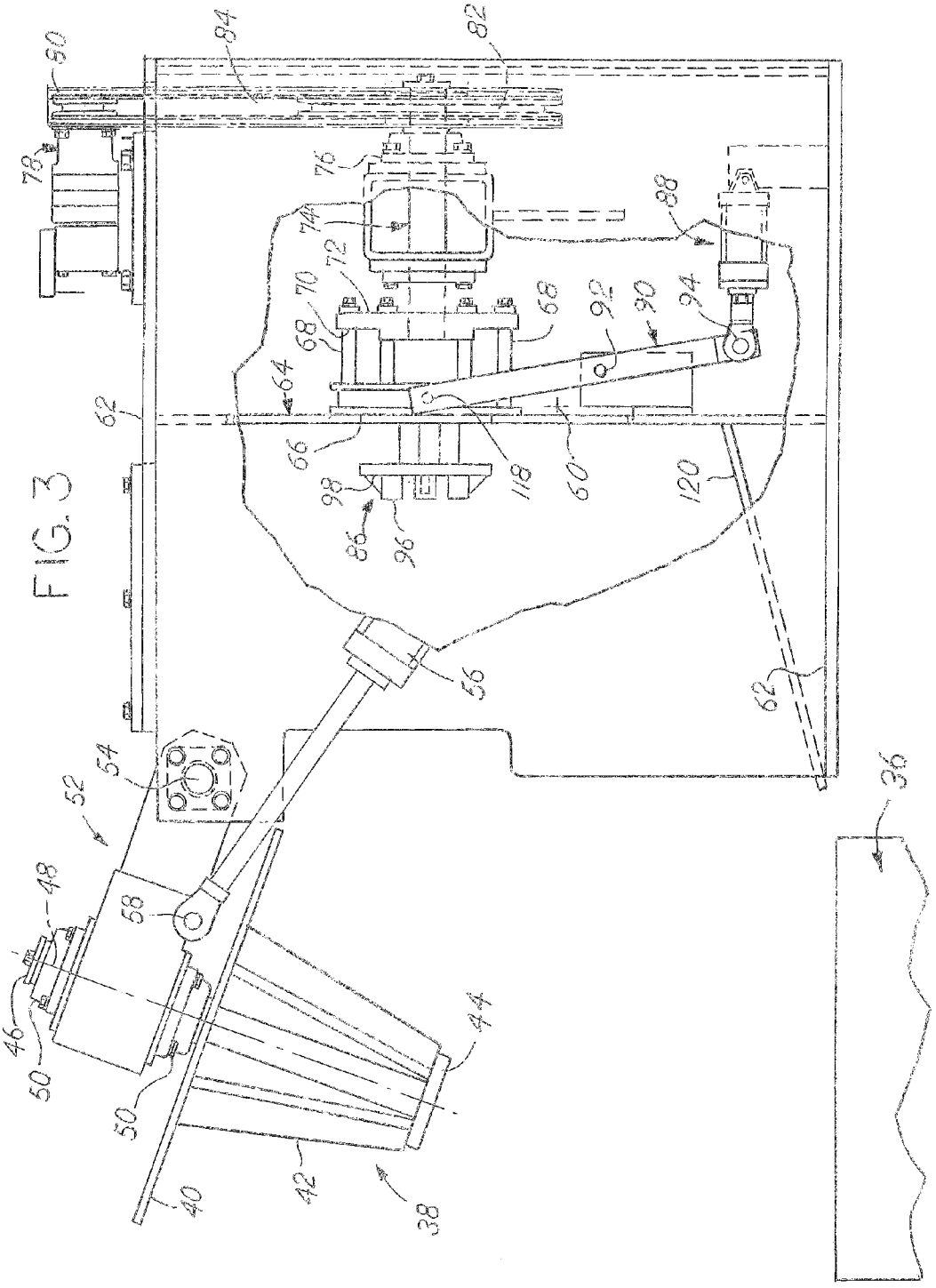
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FIG. 3

FIG. 4

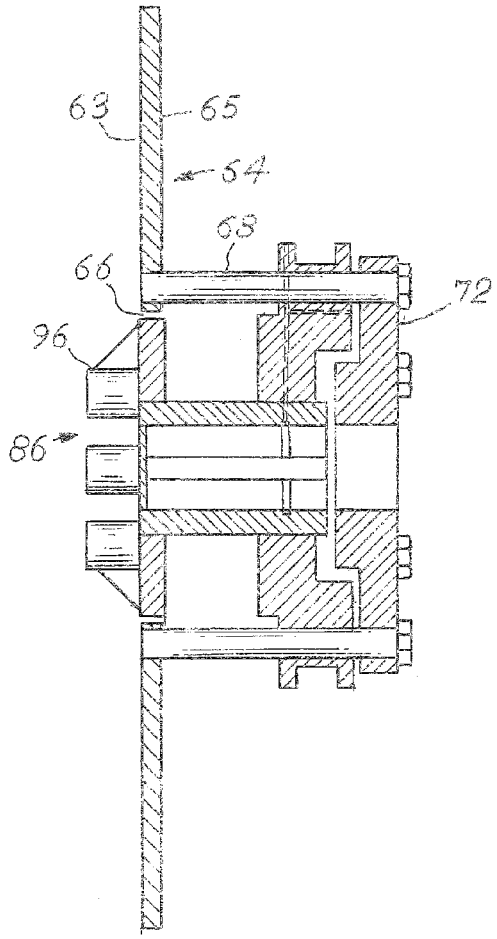
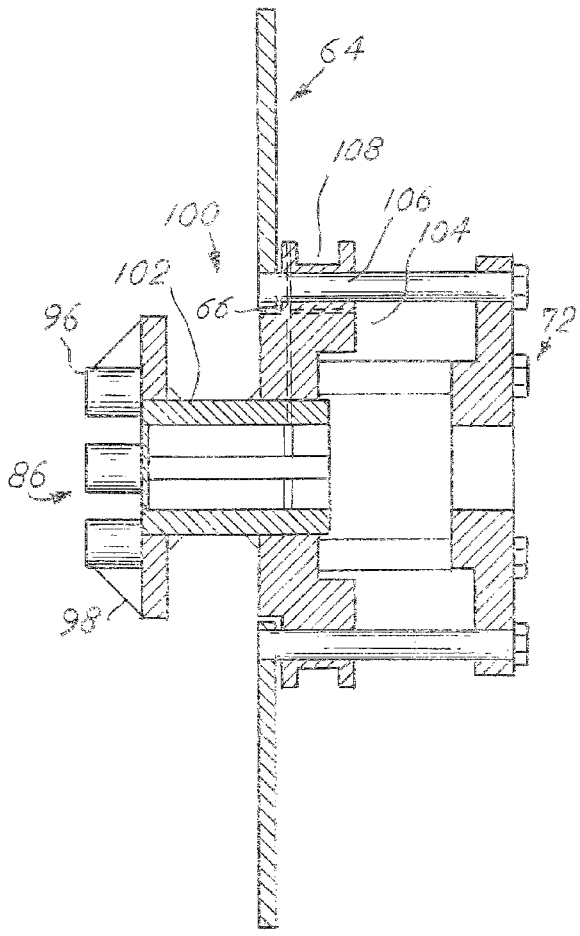


FIG. 5



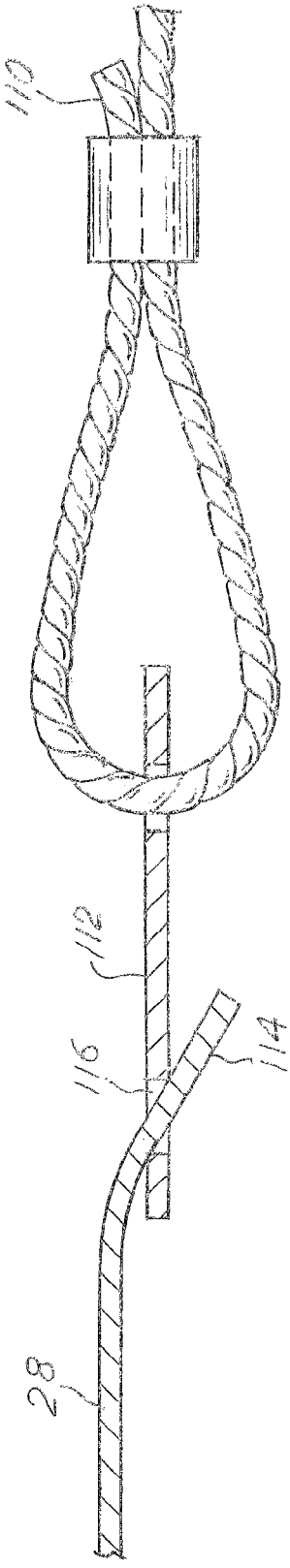


FIG. 6

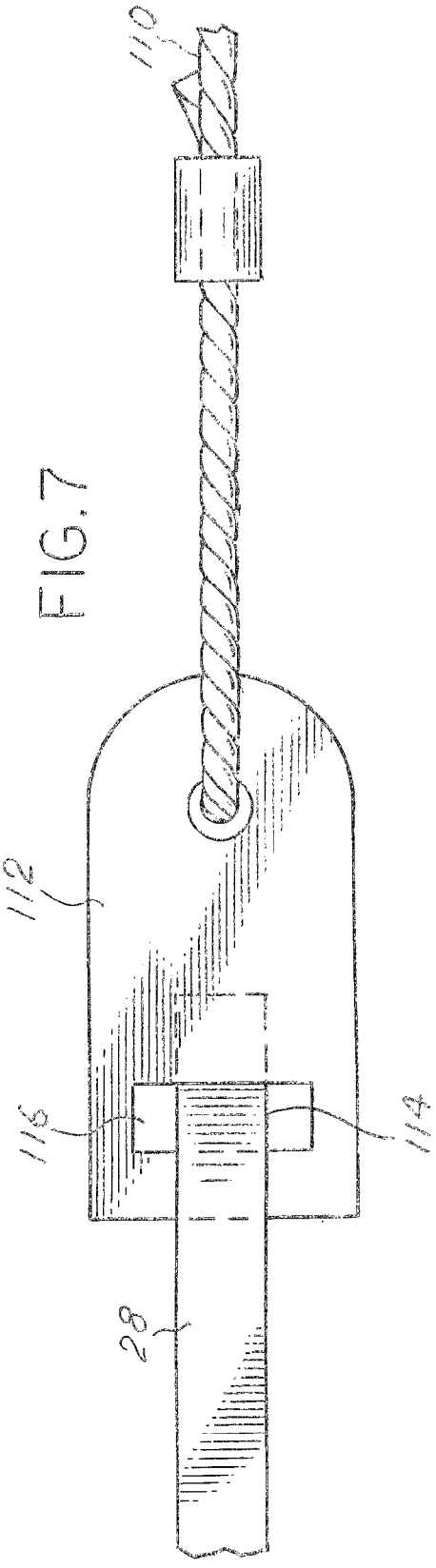


FIG. 7

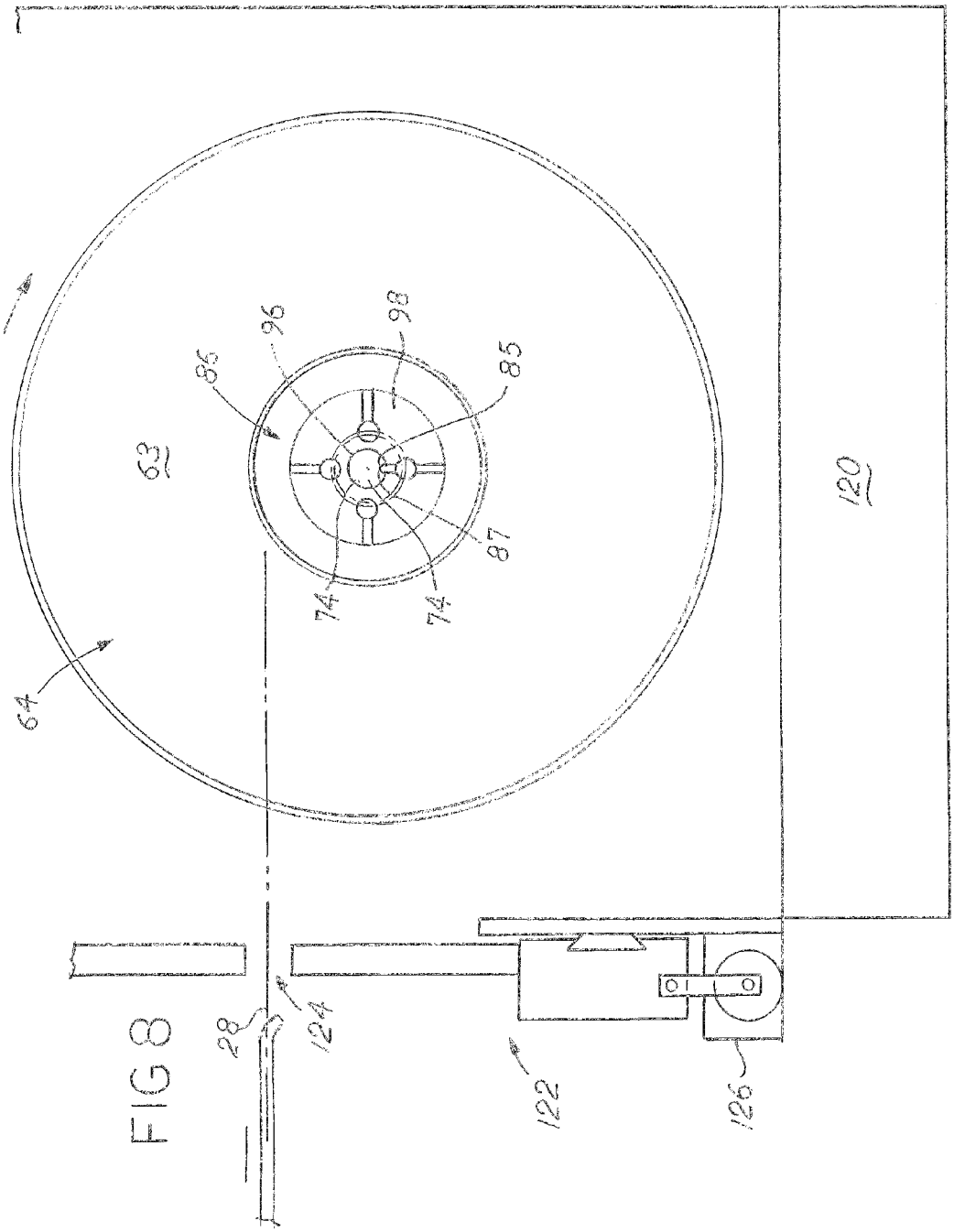


FIG 8

SCRAP WINDER

BACKGROUND OF THE INVENTION

This present disclosure relates to slitting of coil stock and the proper and safe collection of the scrap that is necessarily generated. When coil stock is slitted, the edge quality, width variation, or the total width of the individual slit coils necessarily generates edge trim scrap. This scrap is typically a thin continuous ribbon that is generated while the slitter is processing the coil stock. Scrap must be handled with care and properly captured. Scrap can be wound or chopped. A scrap chopper slices the scrap into individual lengths while it is being generated. Winders coil up the scrap into one continuous coil. Current winders in the art involve a few different styles. A first style is a fixed spool where the scrap is wound. The spool stores the scrap and is also used to transport it. A second style involves a spool with a collapsible spindle. The collapsible spindle design is open on one end while the coil is being wound. When the scrap winder spool is full, the spindle is collapsed enough to release the scrap coil bundle. Feeding the scrap winder is dangerous and difficult, especially when dealing with a large gauge metal or an unpredictable material. An improved scrap winder is necessary.

SUMMARY OF THE INVENTION

The present disclosure describes a scrap winder that has a mandrel that rotates on a pivoting frame. The pivoting frame pivots upward to allow gravity to release the bundle of wound scrap from the mandrel. The mandrel is tapered to facilitate releasing the wound scrap. A yoke slides a sliding hub between an extended position to a refracted position. The extended position allows a cable to be unwound and mated to the beginning of a strip of scrap. When the scrap is pulled enough to be engaged with the hub, it is placed between protrusions or a grouping of posts that causes the scrap to coil when the hub is rotated, also known as a grab. The hub is then retracted and the mandrel is pivoted down to mate with the hub. As the scrap is wound, the mandrel begins to fill up.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of this invention has been chosen wherein:

FIG. **1** is a top view of the slitting line;

FIG. **2** is a side view of the scrap winder in the winding position;

FIG. **3** is a side view of the scrap winder in the release position;

FIG. **4** is a section view taken about line **4-4** of the sliding hub in the retracted position;

FIG. **5** is a section view similar to that of FIG. **4** showing the sliding hub in the extended position;

FIG. **6** is a section side view of the retrieving end of the cable;

FIG. **7** is a top view of the retrieving end of the cable; and

FIG. **8** is a front view of the scrap winder.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A slitting line **10** has an uncoiler station **12** where a master coil **14** of sheet metal **16** is unwound. The sheet metal **16** then proceeds to a slitting station **18** where a series of rotating knives **20** separate the sheet metal **16** into strips **22** of a predetermined width. These strips **22** then proceed to a coiling station **24** where they are wound into slit strip **26**. At the slitting station **18**, a ribbon of edge trim **28** is generated. The edge trim **28** is generated because of the edge quality of the master coil **14** and/or the combined width of the strips **22** may not add up perfectly to the width of the sheet metal **16**. This edge trim **28** is generated as the sheet metal **16** is slit into strips **22** and must be handled properly. The edge trim **28** can have razor sharp edges in the cases of thin stock and be very dangerous for the user to handle. Other times, the stock may be thick material that is difficult to wrestle from the slitter station **18** to the scrap winder **30**. The scrap winder **30** is designed to safely wind and handle the edge trim **28**. The scrap winder **30** winds the edge trim **28** at the same speed as the slitting line **10** to maintain tension on it during winding. Depending on the arrangement of the portions of the slitting line **10**, an eyelet **32** can be inline between the scrap winder **30** and the slitting station **18**. The eyelet **32** is affixed to the floor or part of the slitting line **10** to guide the edge trim **28** from the slitting station **18** to the scrap winder **30**. As shown in FIG. **1**, the slitting line **10** has two scrap winders **30** that are mirror images of each other, but other configurations are possible.

The scrap winder **30** is designed to safely coil the edge trim **28** and then transfer a scrap bundle **34** of edge trim **28** into a hopper **36**. The scrap winder **30** as shown in FIGS. **2** and **3** has a tapered mandrel **38** with a flange plate **40**, a tapered portion **42** and a tip **44**. The tapered portion **42** is wider near the flange plate **40** and smallest near the tip **44**. As shown in FIG. **3**, the mandrel **38** rotates on a shaft **46** about an axis **48** and is supported by bearings **50**. The mandrel is attached to a pivoting frame **52** that pivots about a pivot point **54**. A cylinder **56** as shown in FIG. **3** is attached to the pivoting frame **52** at a pivoting attachment point **58** on one end and a frame attachment point **60** of the scrap winder **30** at the other end. The cylinder **56** moves the pivoting frame **52** and mandrel **38** between a winding position as shown in FIG. **2** and a release position as shown in FIG. **3**. The mandrel **38** is shown as free-wheeling on bearings **50** but can be driven separately by a motor or other means.

The scrap winder **30** has a frame **62** where various parts are attached, including the pivoting frame **52** and cylinder **56**. An inboard flange plate **64** has a mandrel facing side **63** and a yoke facing side **65**. As shown in FIG. **5**, the inboard flange plate **64** has a center aperture **66** and a series of sliding pins **68** extending from the yoke facing side **65**. At terminal ends **70** of the sliding pins **68** is a backstop **72** affixed thereto.

Located in the center aperture **66** is a sliding hub **86** (FIGS. **3-5**). The sliding hub **86** slides between an extended position as shown in FIGS. **3** and **5** and a retracted position as shown in FIGS. **2** and **4**. In the refracted position, the sliding hub is near the backstop **72**. The sliding hub **86** is driven by a key affixed to the driving shaft **74** (FIG. **3**) that mates with a slot **85** (FIG. **4**) on the sliding hub **86**. The key is affixed to the driving shaft **74** using screws or other mechanical means. It is contemplated that the driving shaft **74** is rotationally coupled to the sliding hub through a spline interface or other means that allow axial movement between the two while transferring rotational torque. The driving shaft **74** is supported by bearings **76** and driven by a motor **78** that is coupled to the driving shaft **74** through pulleys **80**, **82**, and a belt or chain **84**. The motor **78** could be hydraulic, electric, or driven by other torque generating device. The motor drives the driving shaft **74** at a controlled torque to regulate the tension in the edge trim **28** as it is wound on the

tapered mandrel **38**. It is contemplated that the driving shaft **74** is driven directly by the motor **78** or other means. The sliding hub **86** slides on the sliding pins **68** and rotates with backstop **72** and inboard flange plate **64**. The sliding hub **86** further includes a series of protrusions **96** that extend from a front face **98** as shown in FIGS. **4** and **5** to form a grab. Behind the front face **98** is a puller cable reel **100** as shown in FIGS. **2** and **3**. The puller cable reel **100** is a sheave with a minor outside diameter **102** that is bordered on one end with the back of the front face **98** and a driving portion **104** as shown in FIGS. **4** and **5** on the other end. The driving portion **104** has a series of apertures **106** that are designed to receive the sliding pins **68**. The driving portion **104** further includes a radial channel **108** that allows a yoke **90** (FIG. **3**) to axially move the sliding hub **86** on the sliding pins **68**. When the sliding hub **86** is refracted, the front face **98** is nearly flush with the inboard flange plate **64**. When the sliding hub **86** is extended, the puller cable reel **100** is exposed to the mandrel facing surface **63**, allowing the user to retrieve a cable **110** as shown in FIGS. **6** and **7**. The cable **110** is affixed to the puller cable reel **100** on one end and has a clip **112** on the loose end. The clip **112** is designed to grab onto the start end **114** of the edge trim **28**. The clip **112** has an aperture **116** that the start end **114** is placed into. Tension in the cable **110** causes the aperture **116** and edge trim **28** to bind, thereby grabbing the edge trim **28**. For thin material, the edge trim **28** can be passed through and bent around the aperture **116** to form a more secure connection between the clip **112** and the edge trim **28**. Rotating the sliding hub **86** causes the cable **110** to wind around the minor outside diameter **102** (FIGS. **4** and **5**), pulling the start end **114** toward the scrap winder **30**.

As shown in FIG. **2**, when the pivoting frame **52** is in the winding position and the sliding hub is in the retracted position, the tip **44** of the mandrel **38** abuts terminal ends of the protrusions **96** on the sliding hub **86**. This creates a winding drum, an area for the edge trim **28** to be captured and wind around the tapered portion **42**.

A cylinder or actuator **88** moves the yoke **90** about a fulcrum **92** to slide the sliding hub **86** between the extended and retracted position as shown in FIGS. **2** and **3**. The actuator is attached at point **94** on one end and a sliding hub mating portion **118** is located on the opposite end. The mating portion **118** is fixed to the axial position of the radial channel **108** (FIG. **2**) to facilitate the movement of the sliding hub **86**. The mating portion **118** allows the sliding hub **86** to rotate. It is contemplated that bushings or bearings are located in the radial channel **108** between the mating portion **118** and the radial channel **108**.

To assist a radially compact bundle **34** (FIG. **1**), an oscillating guide **122** is affixed to the frame **62**. The oscillating guide **122** has an aperture **124** (FIG. **8**) that the edge trim **28** passes through. The guide **122** moves parallel to the axis of the driving shaft **74**, driven by cylinder **126** to direct the edge trim **28** to wind around the mandrel **38** along the axis **48** instead of bunching up adjacent to the inboard flange plate **64**. By directing the edge trim **28**, the overall diameter of the bundle **34** can be better controlled.

When the slitting line **10** is started, the master coil **14** is unrolled and the sheet metal **16** is fed to the slitting station **18**. Here, the edge trim **28** is generated with the start end **114** leading the strip. At this point, the pivoting frame **52** is moved to the release position as shown in FIG. **3** and the sliding hub **86** is in the extended position, revealing the puller cable reel **100**. The cable **110** is then extended by either releasing a portion of the puller cable reel **100** or rotating the sliding hub **86**. The clip **112** is then firmly attached to the start end **114** of the edge trim **28**. Next, the motor **78** and driving shaft **74** are engaged, rotating the sliding hub **86** to retract the cable **110**. As the start end **114** is pulled sufficiently and becomes adjacent to the front face **98**, the start end **114** is disengaged from the clip **112** of the cable **110**. The start end **114** is then placed between the protrusions **96**, also referred to as a gripper slot. The sliding hub **86** can then be retracted and the pivoting frame **52** can be moved to the winding position as shown in FIG. **2**. The motor **78** and driving shaft **74** are then engaged again, causing the start end **114** that is trapped between protrusions **96** to begin to coil around the tapered portion **42** of the mandrel **38**. The mandrel **38** begins to fill and the guide **122** begins to move from being aligned with the inboard flange plate **64** towards the flange plate **40**, causing the individual wraps of the edge trim **28** to fill along the tapered portion **42** of the mandrel **38**. As the master coil **14** becomes depleted, the mandrel **38** fills, eventually holding edge trim **28** of the entire length of the sheet metal **16** as a bundle **34**. When the entire length of the edge trim **28** is held by the scrap winder **30**, the pivoting frame **52** can then be moved to the release position as shown in FIG. **3**, where gravity causes the coiled edge trim to fall onto a ramped surface **120** and then into the hopper **36**.

It is understood that while certain aspects of the disclosed subject matter have been shown and described, the disclosed subject matter is not limited thereto and encompasses various other embodiments and aspects. No specific limitation with respect to the specific embodiments disclosed herein is intended or should be inferred. Modifications may be made to the disclosed subject matter as set forth in the following claims.

What is claimed is:

1. A scrap winder for use with a slitting machine, said slitting machine having an uncoiling portion, a slitting portion, and a recoiling portion, said slitting machine adapted to generate a strip of edge trim, said scrap winder having:

a pivoting frame pivotable between a release position and a winding position, said pivoting frame having a mandrel rotatably affixed thereto and rotatable about a mandrel axis, said mandrel being tapered along its length to a tip;

an inboard flange plate having a center aperture and rotatable about a driving axis, said inboard plate having a mandrel facing surface and a yoke facing surface, said yoke facing surface having pins extending therefrom;

a sliding hub fixed from rotation with respect to said inboard plate and moveable axially through said center aperture between an extended position and a retracted position, said sliding hub fixed from rotation with respect to said inboard plate, said sliding hub having a front face, said retracted position defined by said front face being at a relatively close distance to said mandrel facing surface of said inboard plate, said extended position defined by said front face extending outward from said mandrel facing surface of said inboard plate, said sliding hub having a puller cable reel portion on said sliding hub located adjacent said front face, said puller cable reel portion is outward of said mandrel facing surface when said sliding hub is in said extended position, said front face of said inboard plate adapted to receive a distal end of said strip of edge trim;

a yoke having a sliding hub mating portion mated with an outer diameter of said sliding hub for shifting said sliding hub axially between its said extended position and said retracted position;

a driveshaft rotatable about said driving axis, said inboard plate fixed from rotation with respect to said driveshaft; and

when said pivoting frame is in said winding position, said tip of said mandrel located at a relatively close position to said sliding hub and said mandrel axis substantially coaxial to said driving axis.

2. The scrap winder of claim **1**, and a cable affixed at a terminal end to said sliding hub, said cable having a clip at another terminal end, said clip adapted to affix a start end of said strip of edge trim.

3. The scrap winder of claim **2**, said puller cable reel consisting of a sheave.

4. The scrap winder of claim **3**, an actuator for pivoting said yoke about a fulcrum for shifting said sliding hub axially.

5. The scrap winder of claim **4**, and an oscillating guide having an aperture adapted to receive said scrap, said aperture moveable between a first position and a second position along an axis parallel to said driving axis, said first position defined by said aperture at a relatively close distance from said inboard plate, said second position defined by said aperture at a relatively far distance from said inboard plate.

6. The scrap winder of claim **5**, and a motor driving said driveshaft, said inboard plate, and said sliding hub.

7. A scrap winder for use with a slitting machine, said slitting machine having an uncoiling portion, a slitting portion, and a recoiling portion, said slitting machine adapted to generate a strip of edge trim, said scrap winder having:

a pivoting frame pivotable between a release position and a winding position, said pivoting frame having a mandrel rotatably affixed thereto and rotatable about a mandrel axis;

a sliding hub axially moveable between an extended position and a retracted position on a driveshaft along a driving axis, said sliding hub fixed from rotation with respect to said driveshaft, said sliding hub having a front face, said retracted position defined by said front face being at a relatively large distance from said mandrel, said extended position defined by said front face relatively close to said mandrel, said sliding hub having a puller cable reel portion consisting of a sheave on said sliding hub located adjacent said front face, said puller cable reel portion is outward of said mandrel facing surface when said sliding hub is in said extended position, said front face adapted to receive a distal end of said strip of edge trim;

a yoke having a sliding hub mating portion mated with said sliding hub for shifting said sliding hub axially between its said extended position and retracted position; and

a cable affixed at one terminal end to said puller cable reel portion, said cable having a retrieving end at another terminal end, said retrieving end adapted to affix a start end of said edge trim; and

when said pivoting frame is in said winding position, said mandrel is located at a relatively close position to said sliding hub.

8. The scrap winder of claim **7**, said front face having protrusions affixed thereto, said protrusions extending toward said mandrel.

9. The scrap winder of claim **8**, said mandrel having a tip located at a distal end from said pivoting frame, said taper of said mandrel being smallest nearest said tip.

10. The scrap winder of claim **9**, said yoke mating with an outer diameter of said sliding hub to facilitate movement between said extended and retracted position.

11. The scrap winder of claim **10**, an actuator for pivoting said yoke about a fulcrum for shifting said sliding hub axially with respect to a driveshaft.

12. The scrap winder of claim **7**, and an inboard plate having an aperture and rotatable about said driving axis, said sliding hub located in said aperture, said sliding hub and said inboard plate fixed from rotation with respect to said driveshaft.

13. The scrap winder of claim **12**, said inboard plate having a mandrel facing surface and a yoke facing surface, said inboard plate having pins extending from said yoke facing surface, said sliding hub having apertures adapted to slidably receive said pins.

14. The scrap winder of claim **13**, and an oscillating guide having an aperture adapted to receive said edge trim, said aperture moveable between a first position and a second position along a first axis, said first axis parallel to said driving axis, said first position defined by said aperture at a relatively close distance from said inboard plate, said second position defined by said aperture at a relatively far distance from said inboard plate.

15. The scrap winder of claim **14**, and a motor driving said driveshaft, said inboard plate, and said sliding hub.

16. A scrap winder for use with a slitting machine, said slitting machine having an uncoiling portion, a slitting portion, and a recoiling portion, said slitting machine adapted to generate a strip of edge trim, said scrap winder having:

a mandrel moveable between a release position and a winding position, said mandrel rotatable about a mandrel axis and tapered along its length;

an inboard plate having a center aperture and fixed from rotation with respect to a driveshaft rotatable about a driving axis, said inboard plate having a mandrel facing surface and a yoke facing surface;

a sliding hub fixed from rotation with respect to said driveshaft and axially moveable along said driving axis through said center aperture between an extended position and a retracted position, said sliding hub having a front face, said refracted position defined by said front face being at a relatively close distance to said mandrel facing surface, said extended position defined by said front face extending outward from said mandrel facing surface, said sliding hub having a puller cable reel portion consisting of a sheave on said sliding hub located opposite said front face, said puller cable reel portion is outward of said mandrel facing surface when said sliding hub is in said extended position, said front face having a protrusion adapted to receive a distal end of said strip of edge trim;

a yoke having a sliding hub mating portion mated with said sliding hub for shifting said sliding hub between said extended position and retracted position; and

when said mandrel is in said winding position, said mandrel located at a relatively close position to said sliding hub and said mandrel axis substantially coaxial to said driving axis.

17. The scrap winder of claim **16**, and a cable affixed at one terminal end to said sliding hub, said cable having a retrieving end at the other terminal end, said retrieving end adapted to affix a start end of said strip of edge trim.

18. The scrap winder of claim **17**, said yoke having a fulcrum and pivotable thereto, said yoke having an actuator attachment located oppositely said hub mating portion.

19. The scrap winder of claim **18**, and a motor driving said driveshaft, said inboard plate, and said sliding hub.

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