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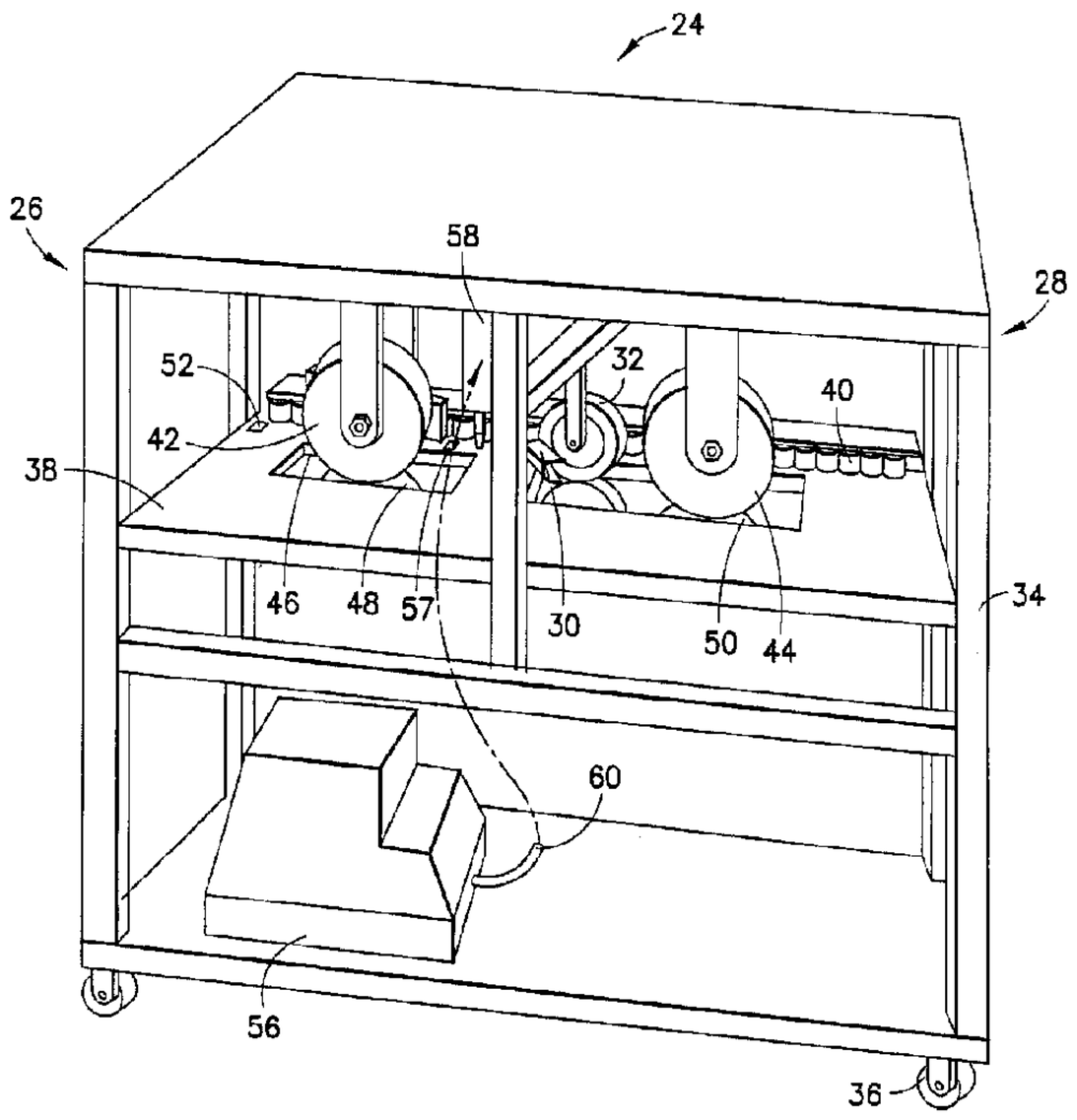
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(54) Title: AUTOMATED EDGE WRAPPING OF A PANEL



(57) Abrégé/Abstract:
A self-contained, portable and automated apparatus and method for wrapping edges of a panel with a protective and/or decorative laminate material comprises conveying means for moving the panel from an entry end of the apparatus to an exit end of the apparatus, lifting means for transversely deflecting the flap upward to a position substantially perpendicular to the front surface of the panel as the panel is conveyed, adhesive application means for applying an adhesive to a back surface of the panel proximate the edge substantially throughout the length of the panel as the panel is moved past the adhesive application means, a folding bar positioned downstream from the adhesive application means at an angle of about 135 to 170 degrees relative to a trailing part of the edge to transversely deflect the flap downward toward the adhesive on the back surface of the panel, and a roller positioned downstream from the folding bar and arranged to spin inwardly over the flap at an angle of about 130 to 150 degrees relative to the trailing part of the edge to cause the flap to stretch inwardly and be secured to the back surface of the panel.

ABSTRACT

A self-contained, portable and automated apparatus and method for wrapping edges of a panel with a protective and/or decorative laminate material comprises conveying means for moving the panel from an entry end of the apparatus to an exit end of the apparatus, lifting means for transversely deflecting the flap upward to a position substantially perpendicular to the front surface of the panel as the panel is conveyed, adhesive application means for applying an adhesive to a back surface of the panel proximate the edge substantially throughout the length of the panel as the panel is moved past the adhesive application means, a folding bar positioned downstream from the adhesive application means at an angle of about **135** to **170** degrees relative to a trailing part of the edge to transversely deflect the flap downward toward the adhesive on the back surface of the panel, and a roller positioned downstream from the folding bar and arranged to spin inwardly over the flap at an angle of about **130** to **150** degrees relative to the trailing part of the edge to cause the flap to stretch inwardly and be secured to the back surface of the panel.

AUTOMATED EDGE WRAPPING OF A PANEL

SPECIFICATION

TECHNICAL FIELD

The embodiments disclosed hereinafter generally relate to a self-contained, portable and automated apparatus and method for wrapping edges of a panel with a protective and/or decorative laminate material.

BACKGROUND

It is desirable for structural and other panels used in aerospace and other applications to be lightweight and provided with a protective and/or decorative laminate coating on their exterior surfaces to provide desired aesthetic, acoustic or other properties. For example, and without limitation, overhead stowage bins are generally composed of fiberglass panels that are provided with an appropriate shape and covered with a protective and/or decorative laminate, such covered panels then being assembled to form the bins. Each panel that makes up a particular structure may be separately fabricated with a laminate covering secured to the panel such that the laminate defines the exterior surface of the fabricated panel. While panel constructions of this type are known to be used in a wide variety of applications, including aerospace applications, the construction of such covered panels, and specifically the application of a laminate cover to the panel has long been an undesirably inefficient, and costly, requiring a high degree of manual labor to ensure that the laminate is properly attached to the panel and avoids undesired looseness, puckering, wrinkling or de-lamination.

Covered panels are typically fabricated by applying a laminate material across a front surface of the panel, such that the laminate material has flaps extending beyond the side edges of the panel, manually wrapping the flaps around the side edges of the panel,

and adhesively securing the flaps to a back surface of the panel. The laminate material may be adhered directly to the front surface of the panel and then stretched and wrapped around the side edges of the panel for adhesive securement to the back surface of the panel. For example, contact cement may be used to adhere the laminate material to the front surface of the panel, which requires time for the contact cement to dry. The flaps are then heated and stretched by hand to wrap the flaps around the side edges, and hot-melt glue is manually applied to adhere the flap to the back surface of the panel. This has been a time consuming and therefore costly manual process, each panel taking approximately **15** minutes to fabricate, depending on the panel's size, with substantial manual manipulation of the panel during the process. Manual fabrication of such panels may also result in injuries to the fabricators, including burning and cutting their fingers and repetitive stress injuries, such as carpel tunnel syndrome.

Automated machines and processes for manufacturing covered panels and articles, including the wrapping of the panel's edges, are known. However, each has a problem in utilization that makes it relatively unattractive to use or requires a complex combination of parts in large factory machinery. There is therefore a need for a simplified, self-contained and portable apparatus and method for automated edge wrapping for a covered panel that improves cost- and time-efficiency as well as safety.

SUMMARY

In one aspect of the invention, a self-contained and portable apparatus for wrapping an edge of a panel with a laminate cover positioned on a front surface of the panel such that the laminate cover has a flap extending past the edge of the panel.

In accordance with one aspect of the invention there is provided an apparatus for wrapping an edge of a panel with a laminate cover positioned on a front surface of the panel such that the laminate cover has a flap extending past the edge of the panel. The apparatus includes conveying provisions for moving the panel from an entry end of the apparatus to an exit end of the apparatus, lifting provisions for transversely deflecting the flap upward to a position substantially perpendicular to the front surface of the panel as the panel is conveyed. The apparatus also includes adhesive application provisions for applying an adhesive to a back surface of the panel proximate the edge substantially throughout the length of the panel as the panel is moved past the adhesive application provisions. The apparatus further includes a folding bar positioned downstream from the adhesive application provisions to transversely deflect the flap downward toward the adhesive on the back surface of the panel, the folding bar being positioned at an obtuse angle relative to a trailing part of the edge. The apparatus also includes a roller positioned downstream from the folding bar and arranged to spin inwardly over the flap at an obtuse angle relative to the trailing part of the edge to cause the flap to stretch inwardly and be secured to the back surface of the panel.

The folding bar may be positioned at an angle of about **135** to **170** degrees relative to the trailing part of the edge.

The roller may include a bottom roller arranged to spin in a direction parallel to the direction of movement of the panel and a top roller positioned to spin at an angle of about **130** to **150** degrees relative to the trailing part of the edge.

The adhesive may be a hot-melt adhesive having a melt temperature of

greater than **450**°F.

The adhesive application provisions may apply the adhesive in the form selected from the group consisting of an adhesive bead, a flat bead and an adhesive spray.

The folding bar may include a radiused back end to gradually deflect the flap downward.

The apparatus may include a platform for supporting the panel in the apparatus.

The apparatus may include a frame supporting the conveying provisions, the lifting provisions, the adhesive application provisions, the folding bar and the roller, the frame being supported on casters to provide flexibility and portability.

The apparatus may include a series of guide rollers extending a length of the apparatus to guide the panel while the panel is being conveyed, each roller in the series of guide rollers supported for rotation about an axis which is substantially perpendicular to the direction of movement of the panel.

In accordance with another aspect of the invention there is provided an apparatus for wrapping an edge of a panel with a laminate cover positioned on a front surface of the panel such that the laminate cover has a flap extending past the edge of the panel. The apparatus includes conveying provisions for moving the panel from an entry end of the apparatus to an exit end of the apparatus. The apparatus also includes lifting provisions for transversely deflecting the flap upward to a position substantially perpendicular to the front surface of the panel as the panel is conveyed. The apparatus

further includes adhesive application provisions for applying an adhesive to a back surface of the panel proximate the edge substantially throughout the length of the panel as the panel is moved past the adhesive application provisions. The apparatus also includes a folding bar positioned downstream from the adhesive application provisions at an angle of about **135** to **170** degrees relative to a trailing part of the edge to transversely deflect the flap downward toward the adhesive on the back surface of the panel. The apparatus further includes a tension roller including a bottom roller arranged to spin in a direction parallel to the direction of movement of the panel and a top roller positioned to spin over the flap at an angle of about **130** to **150** degrees relative to the trailing part of the edge to cause the flap to stretch inwardly and be secured to the back surface of the panel, the tension roller being positioned downstream from the folding bar.

The apparatus may include a frame supporting the conveying provisions, the lifting provisions, the adhesive application provisions, the folding bar and the roller, the frame being supported on casters to provide flexibility and portability.

The folding bar may include a radiused back end to gradually deflect the flap downward.

The apparatus may include a series of guide rollers extending a length of the apparatus to guide the panel while the panel is being conveyed, each roller in the series of guide rollers supported for rotation about an axis which is substantially perpendicular to the direction of movement of the panel.

In accordance with another aspect of the invention there is provided a

method for wrapping an edge of a panel with a laminate cover positioned on a front surface of the panel such that the laminate cover has a flap extending past the edge of the panel. The method involves the steps of positioning the panel at an entry end of an edge wrapping apparatus having a conveying system for effecting generally linear movement of the panel lengthwise through the edge wrapping apparatus, and transversely deflecting the flap upward to a position substantially perpendicular to the front surface of the panel as the panel is moved through the edge wrapping apparatus. The method also involves applying an adhesive to a back surface of the panel proximate the edge substantially throughout the length of the panel as the panel is moved through the edge wrapping apparatus, and moving the panel past a folding bar positioned at an obtuse angle relative to a trailing part of the edge to transversely deflect the flap downward toward the adhesive on the back surface of the panel. The method further involves moving the panel through a roller positioned arranged to spin inwardly over the flap at an obtuse angle relative to the trailing part of the edge to cause the flap to stretch inwardly and be secured to the back surface of the panel.

The folding bar may be positioned at an angle of about **135** to **170** degrees relative to the trailing part of the edge.

The roller may be arranged with a bottom roller arranged to spin in a direction parallel to the direction of movement of the panel and a top roller positioned to spin at an angle of about **130** to **150** degrees relative to trailing part of the edge.

The adhesive may be a hot-melt adhesive having a melt temperature of greater than **450**°F.

The adhesive may be applied in the form selected from the group

consisting of an adhesive bead, a flat bead and an adhesive spray.

The method may involve guiding the panel through the edge wrapping apparatus with a series of guide rollers extending a length of the apparatus, each roller in the series of guide rollers being supported for rotation about an axis which may be substantially perpendicular to the direction of movement of the panel.

The folding bar may be positioned at an angle of about **135** to **170** degrees relative to the trailing part of the edge, and the roller is arranged to spin at an angle of about **130** to **150** degrees relative to trailing part of the edge.

Other features and advantages of the present invention will be apparent when the detailed description of the preferred embodiments is considered in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a panel with a laminate cover prior to edge wrapping.

FIG. **2** is a perspective view of a panel with a laminate cover after edge wrapping.

FIG. **3** is a front, top and right side perspective view of an edge wrapping apparatus.

FIG. **4** is an entry side view of the edge wrapping apparatus shown in FIG. **3**.

FIG. **5** is an exit side view of the edge wrapping apparatus shown in FIG. **3**.

FIG. **6** is a close-up front plan view of the apparatus of FIG. **3**, in process of applying adhesive to a panel, folding a flap of the laminate cover, and stretching and sealing the flap to the back cover of the panel.

FIG. **7** is a top view of the apparatus shown in FIG. **6**.

Reference will hereinafter be made to the drawings in which similar elements in different drawings bear the same reference numerals.

DETAILED DESCRIPTION

In the following description, a typical construction of edge-wrapped panels for use in the aerospace industry, as well as other industries, is briefly described for background purposes, but it will be appreciated that variations in the shape, size,

composition and construction of such panels can be adapted depending on their intended use while still permitting their edge wrapping in accordance with the teachings of this disclosure.

Referring to FIGS. **1** and **2**, respectively, a rectangular shaped panel is illustrated before and after edge wrapping. The panel **10** is composed of a lightweight material that is generally stiff or rigid, such as fiberglass, aluminum or plastic, but any other generally stiff or rigid material may be wrapped in accordance with the apparatus and method disclosed herein. The panel has a flat, sheet-like configuration defined by large front **14** and back **22** surfaces, and a thickness that is small in comparison to its length and width dimensions. The size and shape of the panel is dependent on the desired end use. Wrapped panels useful in aerospace applications typically have at least one straight edge and a length of **48**, **60** or **90** inches. However, there is no limit as to the size of panels that may be wrapped in accordance with the disclosure herein.

The panel **10** has a flexible laminate cover **12** completely covering one surface of the panel, referred to herein as the front surface **14** of the panel, and extending past at least one side edge **16** of the panel to form a flap **18** that protrudes outwardly from the side edge **16**. In the embodiment shown in FIG. **1**, the laminate cover is large enough to form two flaps **18**, **20**. Additional embodiments may include a cover that forms flaps extending outwardly from each of the panel's side edges. The flaps typically extend about ½ inch past the panel's side edges. The laminate cover may be any lightweight, thin and flexible material that provides the desired aesthetic, acoustic or other properties to the front surface **14** of the panel. For example, and without limitation, the laminate cover may be made from vinyl, plastic, textile or nonwoven materials. The laminate cover is preferably thin like paper, approximately **10** to **20** thousandths of an inch, but

can be thicker as long as the laminate cover remains soft and pliable without the application of heat. Each of the flaps **18**, **20** of the laminate cover is intended to be wrapped around the side edges **16** of the panel such that the laminate cover completely covers the front surface **14**, forms a wrapped edge around the side edges **16** and is adhesively engaged with the back surface **22** of the panel, as illustrated in FIG. **2**. When so wrapped, the panel may be used to form a variety of parts and assemblies for use in aerospace and other applications.

Referring to FIGS. **3-7**, a self-contained and portable edge wrapping apparatus **24** is shown that automatically wraps a flap **18** around the side edge **16** of a panel **10**, stretches the flap **18**, and adhesively secures the flap **18** to the back surface **22** of the panel **10** as the panel is moved lengthwise through the apparatus. For this purpose, the edge wrapping apparatus **24** comprises a conveying means for moving the panel **10** from an entry end **26** (FIG. **4**) of the apparatus to an exit end **28** (FIG. **5**) of the apparatus, lifting means for transversely deflecting the flap upward to a position substantially perpendicular to the front surface **14** of the panel **10** as the panel is conveyed through the apparatus, adhesive application means for applying an adhesive to a back surface **22** of the panel proximate the edge **16** substantially throughout the length of the panel **10** as the panel is moved past the adhesive application means, a folding bar **30** positioned downstream from the adhesive application means to transversely deflect the flap **18** downward toward the adhesive on the back surface **22** of the panel **10**, and a sealing roller **32** positioned downstream from the folding bar **30** and arranged to spin inwardly over the flap to cause the flap to stretch inwardly and be secured to the back surface of the panel.

The edge wrapping apparatus **24** is flexible in its set up for versatile uses. All of

the foregoing components are mounted on a frame **34** having casters **36** to provide portability, such that the apparatus may be freely moved anywhere in a factory or otherwise. For example, the edge wrapping apparatus **24** may be placed next to any available table to provide a means for automatically stacking wrapped panels at the exit end **28** after discharge from the apparatus or stacking unwrapped panels at the entry end **26** to facilitate placement of unwrapped panels into the apparatus. The frame may be constructed from bars of any material capable of carrying the weight of the components. The bars may be arranged in positions that permit the preferred arrangement of the folding, sealing and adhesive application components of the apparatus. The frame may also include shelving for housing various components such as the adhesive application means, to permit all components to be housed on the frame, and provide a self-contained, portable edge wrapping apparatus.

The edge wrapping apparatus **24** comprises a platform **38** that extends lengthwise of the apparatus and supports the panel as it is moved through the apparatus from the entry end **26** to the exit end **28**. The platform **38** comprises a material or has a coating that prevents scratching or binding of the panel **10** or laminate cover **12**, such as TEFLON®. The platform is set at a height to be useful in combination with automatic or other systems at the entry and exit of the apparatus. However, the platform height may be set higher or lower to accommodate manual operation of the apparatus by a variety of users. In other embodiments, the platform and other components of the edge wrapping apparatus could be made to be adjustable to change the height after the apparatus is assembled.

In preparation for entry into the edge wrapping apparatus **24**, a laminate cover **12** should be adhesively secured to a panel **10** with at least one flap **18** extending past a side

edge **16** of the panel. Any type of adhesive suitable for the intended purpose and materials may be used. Preferred adhesives include contact cement, pressure sensitive adhesives or hot-melt adhesives. The flaps **18** should be trimmed to approximately ½ inch past the side edge **16** of the panel. The covered panels may then be manually inserted into the edge wrapping apparatus **24** or may be inserted via an automatic feeding system for sequentially supplying covered panels to the edge wrapping apparatus.

The covered panels are inserted into the entry end **26** of the edge wrapping apparatus **24** by placing a leading edge of the unwrapped panel with the laminate cover or front surface **14** facing down onto the platform **38**. Referring to FIG. **4**, the side edge **16** with the flap **18** is placed adjacent a series of guide rollers **40** that extend the entire length of the apparatus to provide a guide for the panel as it moves through the apparatus. Each roller in the series of guide rollers **40** is arranged to rotate about an axis positioned perpendicular to the platform, such that rolling surface of each roller is positioned to contact the side edge **16** of the panel **10**.

Conveying means are provided to move the panel through the apparatus from the entry end **26** to the exit end **28**, as it is guided by the platform **38** and the series of guide rollers **40**. As shown in the drawings, a first drive wheel **42** is provided proximate the entry end **26** and a second drive wheel **44** is provided proximate the exit end **28**. The first and second drive wheels are positioned to rotate about an axis that is parallel to the platform **38**, and provide sufficient rotational force to engage and move the panel across the platform. The first and second drive wheels may be singular wheels arranged on top of the platform such that the panel **10** travels between the drive wheel and the platform. Alternatively, as shown in the drawings, each of the drive wheels may comprise top and bottom wheels arranged to form a nip that provides rotational force to both the front

surface **14** and the back surface **22** of the panel. If such wheel pairs are used, then the platform should have openings **46** large enough to permit the bottom wheel in each pair **48**, **50** to extend through the opening and contact the upper wheel in each pair **42**, **44**. Drive wheels sufficient for this purpose are preferably non-marking rubber tread wheels of the type available from Albion Inc., Albion, Michigan. Stepper or other type of motors (not shown) may be used to power the drive wheels and provide variable rotational speeds of the drive wheels. It has been found that setting the drive wheels at speeds of approximately **240** inches per minute permits wrapping edges of a **60** inch panel in about **15** seconds, instead of the **15** minutes it currently takes to manually wrap the same panel. It is understood that the drive wheels and platform shown in the drawings may be replaced with a conveyor belt arranged horizontally from the entry end **26** to the exit end **28** to translate the panel **10** through the apparatus. A platform may be situated under a top portion of the conveyor belt to provide additional support for the panel as it is conveyed through the apparatus.

A first sensor **52** is provided at the entry end to sense when a panel is placed in the apparatus and is ready to be wrapped. For example, an infrared sensor may be used to detect an interruption when the panel enters the apparatus. When such interruption is detected, the stepper motors are activated, causing the drive wheels (or other conveying means) to rotate and the panel to move through the apparatus. Alternatively, a switch can be provided to turn the stepper motors on and off.

Lifting means is provided at the entry end **26** for transversely deflecting the flap **18** upward to a position substantially perpendicular to the front surface **14** of the panel as the panel **10** is conveyed through the apparatus. The lifting means may be in the form of a finger, bar or other type of ramped structure to effectuate lifting of the flap. Referring

to FIG. **4**, a bar **54** is provided with a downward angle from the entry end **26**, such that when the flap contacts the lower end of the bar **54**, the bar effects upward deflection of the flap. The flap is then supported between the bar **54** and the series of guide rollers **40** in a position substantially perpendicular to the front surface **14** of the panel to ready the flap for wrapping and adhesive securement to back surface of the panel. In a preferred embodiment, the bar is made from a material or coated with a surface coating to facilitate sliding of the flap between the bar and the series of guide rollers **40** without binding, such as TEFLON®.

Adhesive application means is provided downstream of the lifting means to apply an adhesive to a back surface **22** of the panel **10** proximate the side edge **16** substantially throughout the length of the panel as the panel is moved past the adhesive application means. Preferred adhesives are epoxy, hot-melt adhesives having a melt temperature greater than **450**°F. For example, a preferred type of adhesive is LOCTITE® HYSOL **7802**R available from Henkel Corp., Westlake, Ohio, having a melting temperate of about **450**°F. The adhesive may be applied in liquid or spray form, with liquid applicators forming either round or flat beads. Adhesive application systems available from Hot Melt Technologies, Inc., Rochester Hills, Michigan have been found to be useful for these purposes. Such systems typically include a hot melt adhesive tank and pump system **56**, a nozzle **58** and a hose **60** connecting the nozzle to the tank system. The nozzle **58** may be arranged on the edge wrapping apparatus such that the tip **59** of the nozzle is pointing down toward the back surface **22** of the panel **10** to apply a continuous adhesive bead **62** to the back surface **22**, as shown in FIG. **6**. The first sensor **52** or the main power switch for the edge wrapping apparatus may activate the adhesive application system. Alternatively, a second sensor **57** may be provided downstream from

the front drive wheel **42** to sense the panel **10** and activate the adhesive application system as the panel **10** is conveyed past the nozzle **58**. Both the first and second sensors may be placed in the platform **38** or on the side of the platform.

A folding bar **30** is positioned downstream from the adhesive applicator **58** to extend from beyond the side edge **16** in toward the center of the panel to transversely deflect the flap **18** down toward the adhesive **62** on the back surface **22** of the panel **10** as the panel is conveyed from the entry end **26** to the exit end **28** of the apparatus. In FIG. **6**, the panel **10** is moved from left to right and the folding bar **30** deflects the flap **18** down. The folding bar is positioned at an obtuse angle, preferably **135** to **170** degrees, relative to the side edge **16** with the flap **18** prior to folding as shown in FIG. **7**. The length of the folding bar should be selected to extend at least past the flap **18** when in a folded position (for example, as shown on the right side of the folding bar **30** in FIG. **7**), at least ½ inch in from the side edge **16**. The folding bar **30** comprises a radiused rear side **66**, preferably with a ½ to ¾ inch radius, to facilitate folding of the flap **18** toward the back surface **22** of the panel **10**, and can be made from any rigid material such as aluminum or other metals.

After the flap **18** is folded down against the back surface **22** of the panel **10**, the folded flap **19** is preferably stretched inward under pressure to provide a smooth seal to the panel. For this purpose, a tension roller **32** is positioned downstream from the folding bar **30** and arranged to spin while in contact with the folded flap **19**. The roller spins inwardly (counterclockwise as shown in FIG. **6**) over the folded flap **19** at an obtuse angle, preferably **130** to **150** degrees, and most preferably about **135** degrees, relative to the side edge **16** with the flap **18** prior to folding as shown in FIG. **7**. The tension roller **32**, similar to the drive wheels **42, 44**, may be a single roller above the

platform **38**, or may be arranged as a top and bottom pair of rollers. When a pair of rollers is used, the bottom tension roller **70** is arranged to spin about an axis substantially perpendicular to the side edge **16** and the top tension roller is arranged to spin inwardly at the obtuse angle described above. A spring is provided to cause the rollers to bias toward each other and provide pressure of about **10** pounds to the folded flap **19** as it passes through the nip of the tension rollers. This arrangement pulls, stretches and squeezes the folded flap **19** to prevent wrinkles or voids in the sealed flap and the laminate cover **12** on the front surface **14** of the panel **10**. Use of a pair of tension rollers with a straight roller on bottom and an angled roller on top as described above facilitates the pulling and stretching effect. Tension rollers sufficient for these purposes are non-marking rubber tread wheels of the type available, for example, from Albion Inc., Albion, Michigan or Bosch Rexroth AG, Germany. The tension roller **32** is tensioned by gravity, and no power is needed to cause the tension roller **32** to spin. Movement of the panel **10** through the apparatus **24** causes the tension roller **32** to spin. However, a stepper motor may be provided for powering the tension roller **32**, which may be activated when the main power switch is turned on, or when either the first or second sensors **52**, **57** sense a panel **10** in the edge wrapping apparatus **24**.

As the flap **18** is been adhesively secured to the back surface **22** of the panel **10**, the second drive wheel **44** provides sufficient force to discharge the panel from the exit end **28** (shown in FIG. **5**) of the edge wrapping apparatus.

As described above, the edge wrapping apparatus can be situated next to an appropriate bin or table that collects the panels as they are discharged for subsequent processing or handling if desired. For example, a second edge wrapping apparatus may be positioned adjacent a first edge wrapping apparatus to receive panel with one wrapped

edge from the first edge wrapping apparatus, and having the components arranged such that a flap on a second edge of the panel may be folded, wrapped and sealed to the back surface of the panel.

While the invention has been described with reference to various embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. For example, the edge wrapping apparatus may be modified to permit wrapping of edges that are not straight by providing the series of guide rollers **40** with a curve, and could be modified to provide a complimentary and additional set of components on the opposite side of the apparatus to permit simultaneous wrapping, folding and sealing of a second flap. In addition, many modifications may be made to adapt a particular situation to the teachings of the invention without departing from the essential scope thereof. Therefore it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An apparatus for wrapping an edge of a panel with a laminate cover positioned on a front surface of the panel such that the laminate cover has a flap extending past the edge of the panel, the apparatus comprising:

conveying means for moving the panel from an entry end of the apparatus to an exit end of the apparatus;

lifting means for transversely deflecting the flap upward to a position substantially perpendicular to the front surface of the panel as the panel is conveyed;

adhesive application means for applying an adhesive to a back surface of the panel proximate the edge substantially throughout the length of the panel as the panel is moved past the adhesive application means;

a folding bar positioned downstream from the adhesive application means to transversely deflect the flap downward toward the adhesive on the back surface of the panel, the folding bar being positioned at an obtuse angle relative to a trailing part of the edge; and

a roller positioned downstream from the folding bar and arranged to spin inwardly over the flap at an obtuse angle relative to the trailing part of the edge to cause the flap to stretch inwardly and be secured to the back surface of the panel.

2. The apparatus of claim **1**, wherein the folding bar is positioned at an angle of about **135** to **170** degrees relative to the trailing part of the edge.

3. The apparatus of claim **1**, wherein the roller comprises a bottom roller arranged to spin in a direction parallel to the direction of movement of the panel and a top roller positioned to spin at an angle of about **130** to **150** degrees relative to the trailing part of the edge.

4. The apparatus of claim **1**, wherein the adhesive is a hot-melt adhesive having a melt temperature of greater than **450**°F.

5. The apparatus of claim **4**, wherein the adhesive application means applies the adhesive in the form selected from the group consisting of an adhesive bead, a flat bead and an adhesive spray.

6. The apparatus of claim **1**, wherein the folding bar comprises a radiused back end to gradually deflect the flap downward.

7. The apparatus of claim **1**, further comprising a platform for supporting the panel in the apparatus.

8. The apparatus of claim **1**, further comprising a frame supporting the conveying means, the lifting means, the adhesive application means, the folding bar and the roller, the frame being supported on casters to provide flexibility and portability.

9. The apparatus of claim **1**, further comprising a series of guide rollers extending a length of the apparatus to guide the panel while the panel is being conveyed, each roller in the series of guide rollers supported for rotation about an axis

which is substantially perpendicular to the direction of movement of the panel.

10. An apparatus for wrapping an edge of a panel with a laminate cover positioned on a front surface of the panel such that the laminate cover has a flap extending past the edge of the panel, the apparatus comprising:

conveying means for moving the panel from an entry end of the apparatus to an exit end of the apparatus;

lifting means for transversely deflecting the flap upward to a position substantially perpendicular to the front surface of the panel as the panel is conveyed;

adhesive application means for applying an adhesive to a back surface of the panel proximate the edge substantially throughout the length of the panel as the panel is moved past the adhesive application means;

a folding bar positioned downstream from the adhesive application means at an angle of about **135** to **170** degrees relative to a trailing part of the edge to transversely deflect the flap downward toward the adhesive on the back surface of the panel; and

a tension roller comprising a bottom roller arranged to spin in a direction parallel to the direction of movement of the panel and a top roller positioned to spin over the flap at an angle of about **130** to **150** degrees relative to the trailing part of the edge to cause the flap to stretch inwardly and be secured to the back surface of the panel, the tension roller being positioned downstream from the folding bar.

11. The apparatus of claim **10**, further comprising a frame supporting the conveying means, the lifting means, the adhesive application means, the folding bar and the roller, the frame being supported on casters to provide flexibility and portability.

12. The apparatus of claim **11**, wherein the folding bar comprises a radiused back end to gradually deflect the flap downward.

13. The apparatus of claim **12**, further comprising a series of guide rollers extending a length of the apparatus to guide the panel while the panel is being conveyed, each roller in the series of guide rollers supported for rotation about an axis which is substantially perpendicular to the direction of movement of the panel.

14. A method for wrapping an edge of a panel with a laminate cover positioned on a front surface of the panel such that the laminate cover has a flap extending past the edge of the panel, the method comprising the steps of:

positioning the panel at an entry end of an edge wrapping apparatus having a conveying system for effecting generally linear movement of the panel lengthwise through the edge wrapping apparatus;

transversely deflecting the flap upward to a position substantially perpendicular to the front surface of the panel as the panel is moved through the edge wrapping apparatus;

applying an adhesive to a back surface of the panel proximate the edge substantially throughout the length of the panel as the panel is moved through the edge wrapping apparatus;

moving the panel past a folding bar positioned at an obtuse angle relative to a trailing part of the edge to transversely deflect the flap downward toward the adhesive on the back surface of the panel; and

moving the panel through a roller positioned arranged to spin inwardly over the flap at an obtuse angle relative to the trailing part of the edge to cause the flap to stretch inwardly and be secured to the back surface of the panel.

15. The method of claim **14**, wherein the folding bar is positioned at an angle of about **135** to **170** degrees relative to the trailing part of the edge.

16. The method of claim **14**, wherein the roller is arranged with a bottom roller arranged to spin in a direction parallel to the direction of movement of the panel and a top roller positioned to spin at an angle of about **130** to **150** degrees relative to trailing part of the edge.

17. The method of claim **14**, wherein the adhesive is a hot-melt adhesive having a melt temperature of greater than **450**°F.

18. The method of claim **14**, wherein the adhesive is applied in the form selected from the group consisting of an adhesive bead, a flat bead and an adhesive spray.

19. The method of claim **14**, further comprising guiding the panel through the edge wrapping apparatus with a series of guide rollers extending a length of the apparatus, each roller in the series of guide rollers being supported for rotation

about an axis which is substantially perpendicular to the direction of movement of the panel.

20. The method of claim **14**, wherein the folding bar is positioned at an angle of about **135** to **170** degrees relative to the trailing part of the edge, and the roller is arranged to spin at an angle of about **130** to **150** degrees relative to trailing part of the edge.

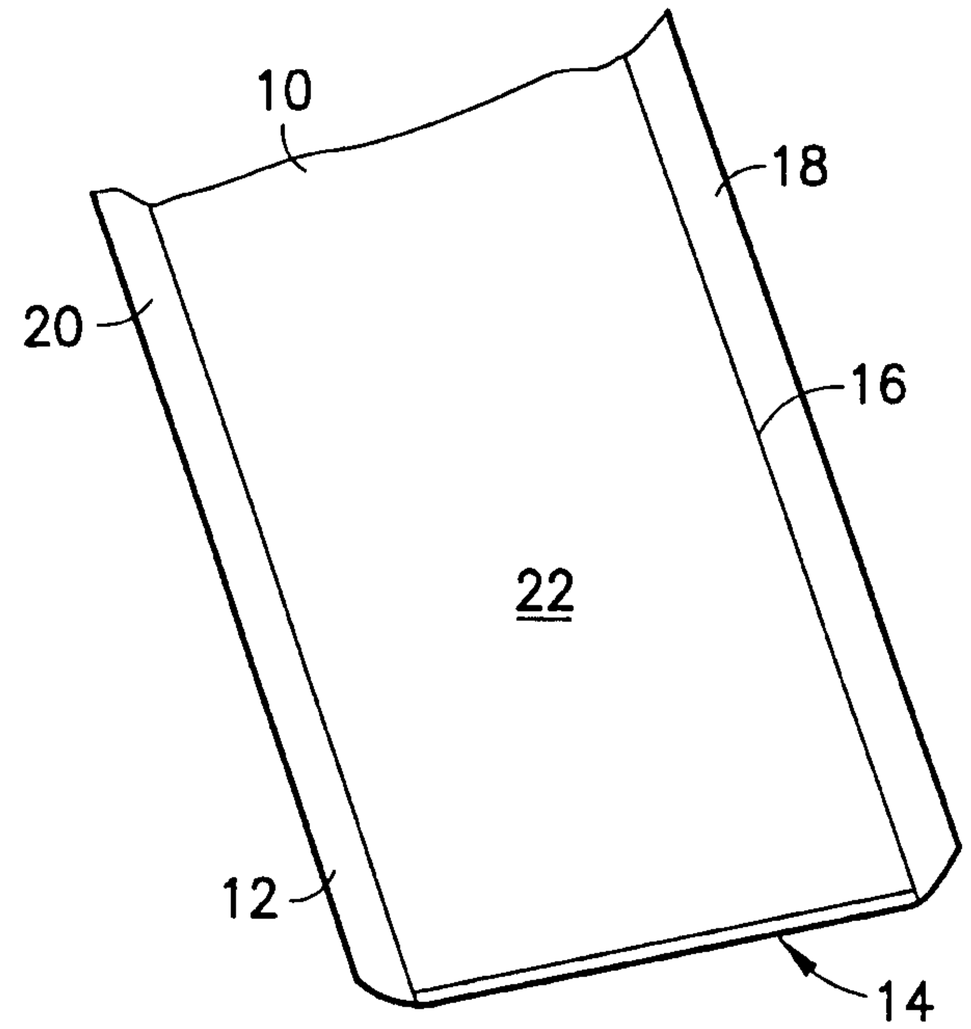


FIG.1

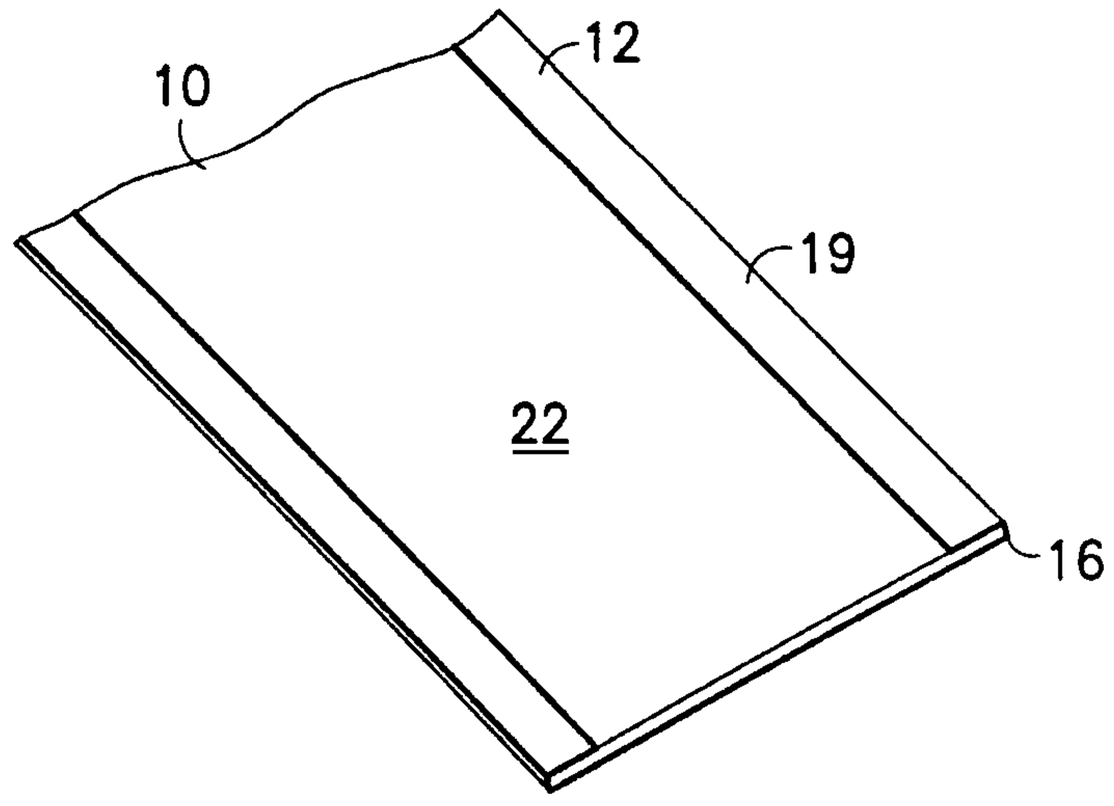


FIG.2

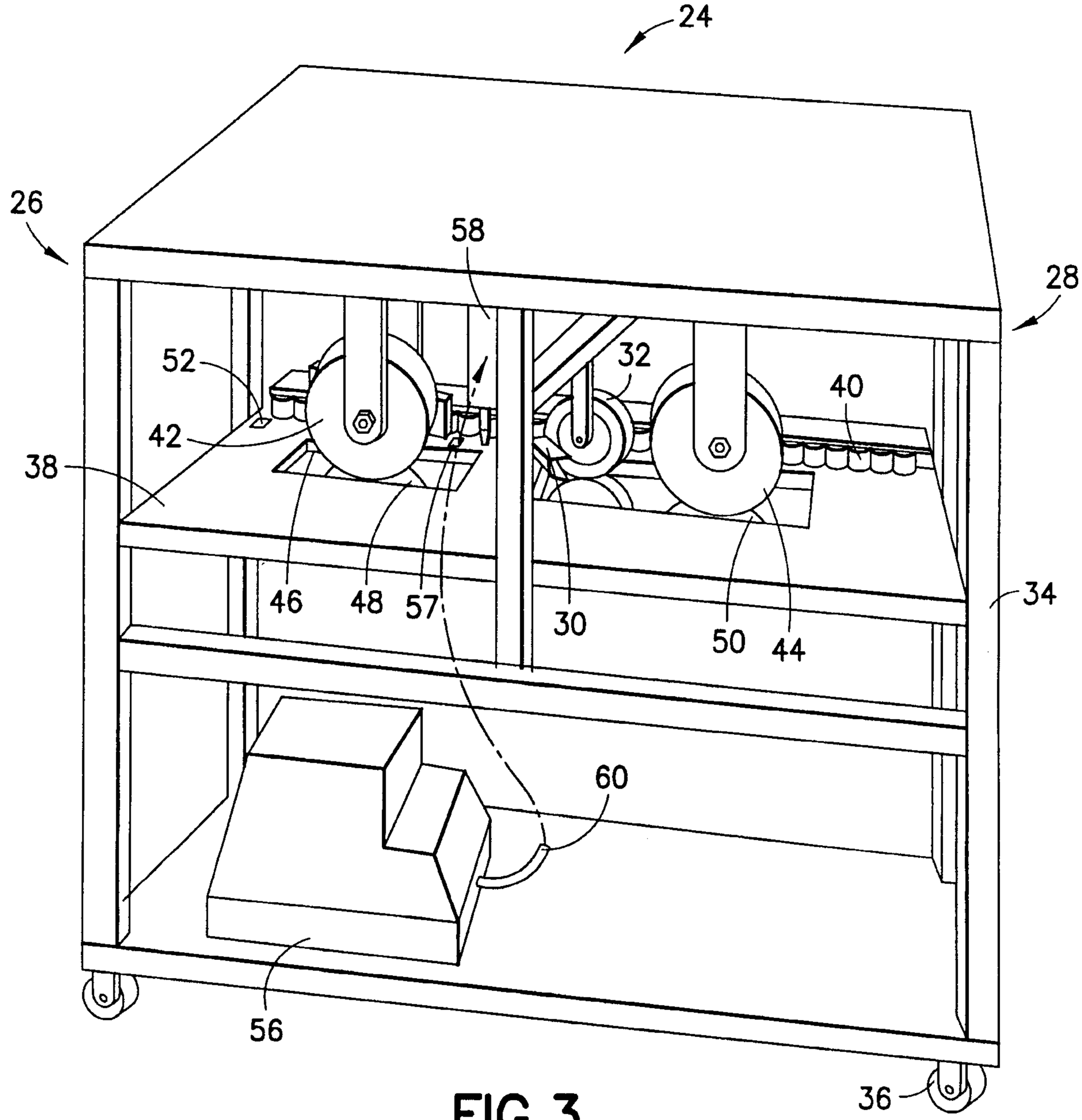


FIG.3

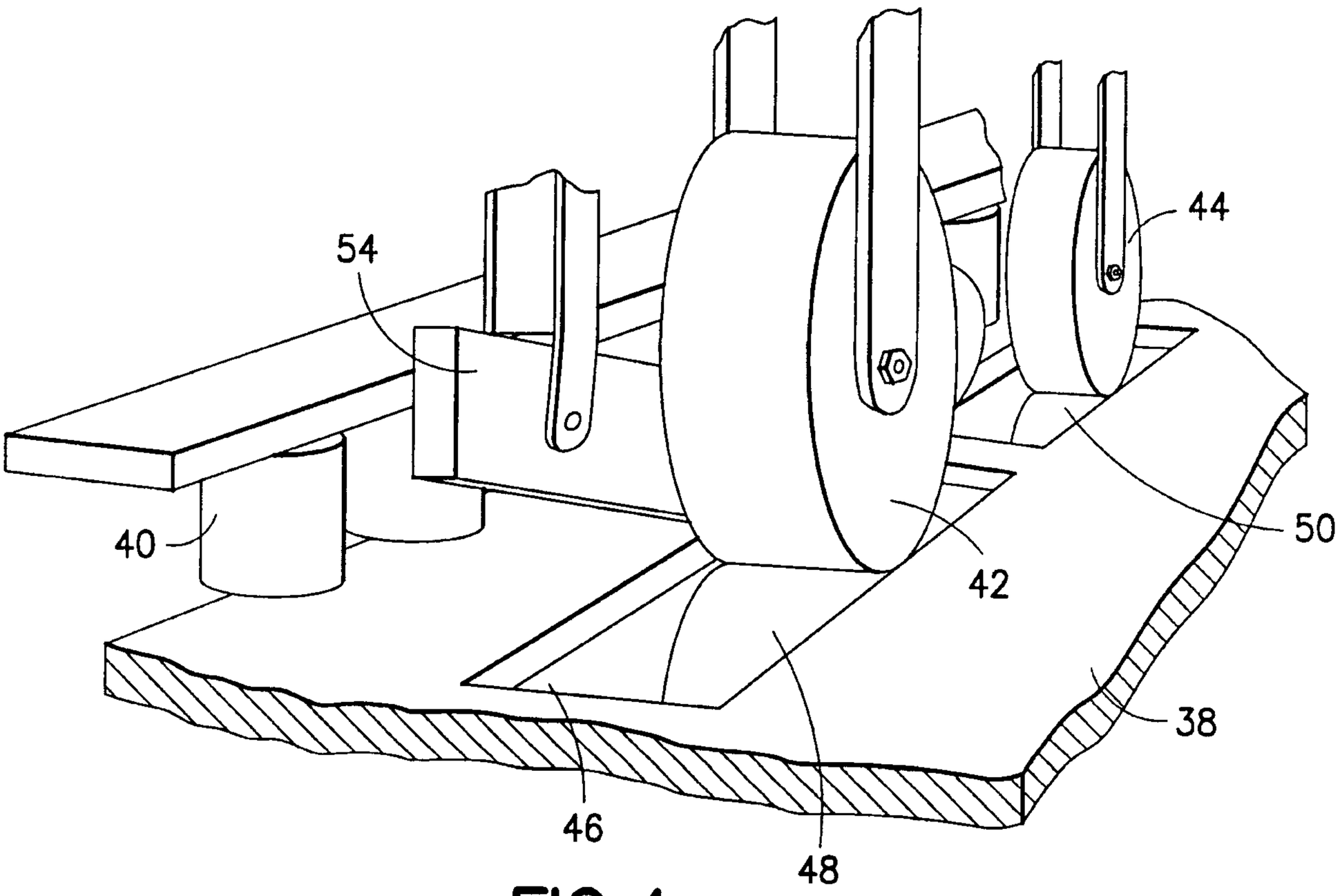


FIG.4

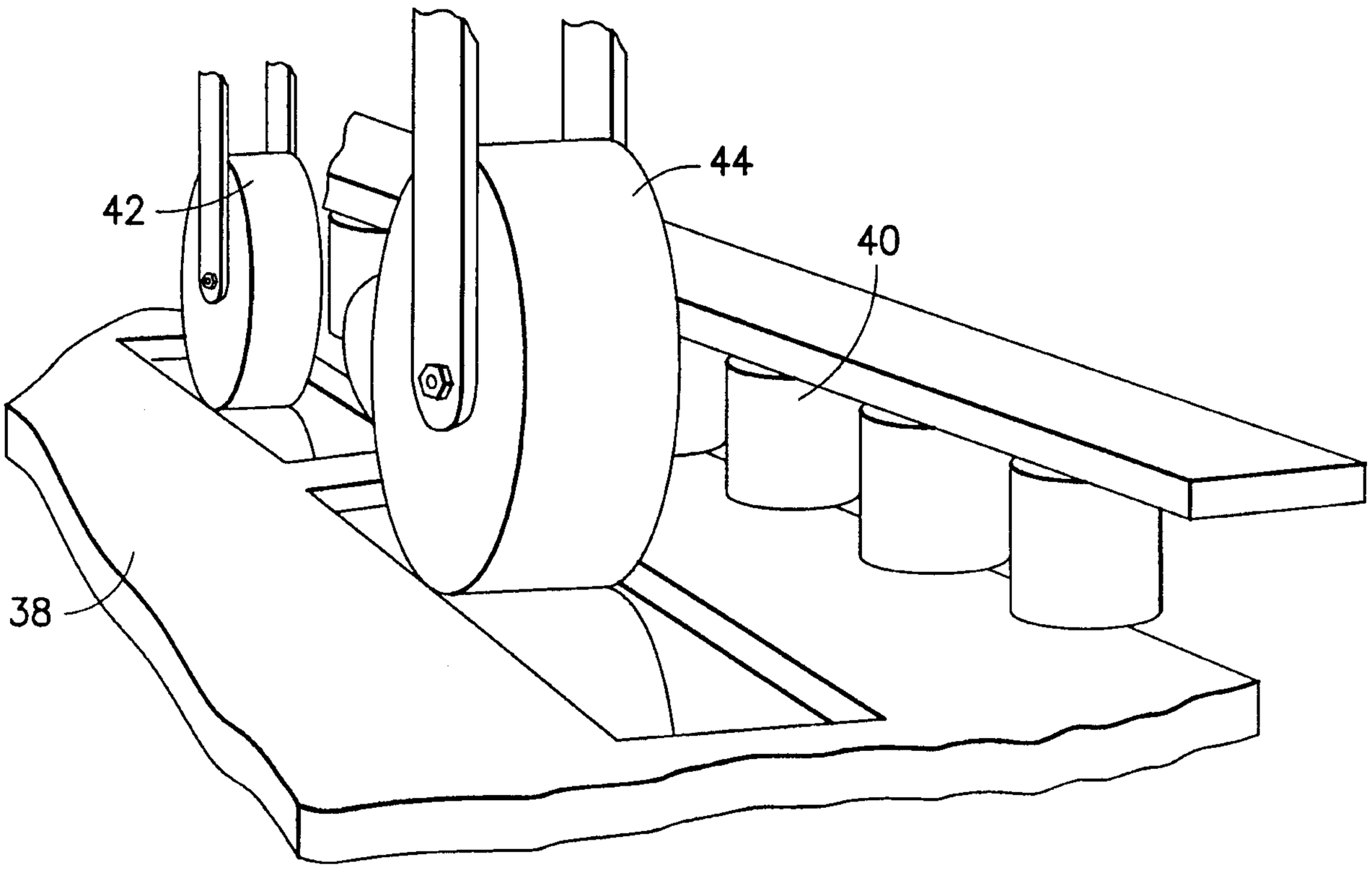


FIG.5

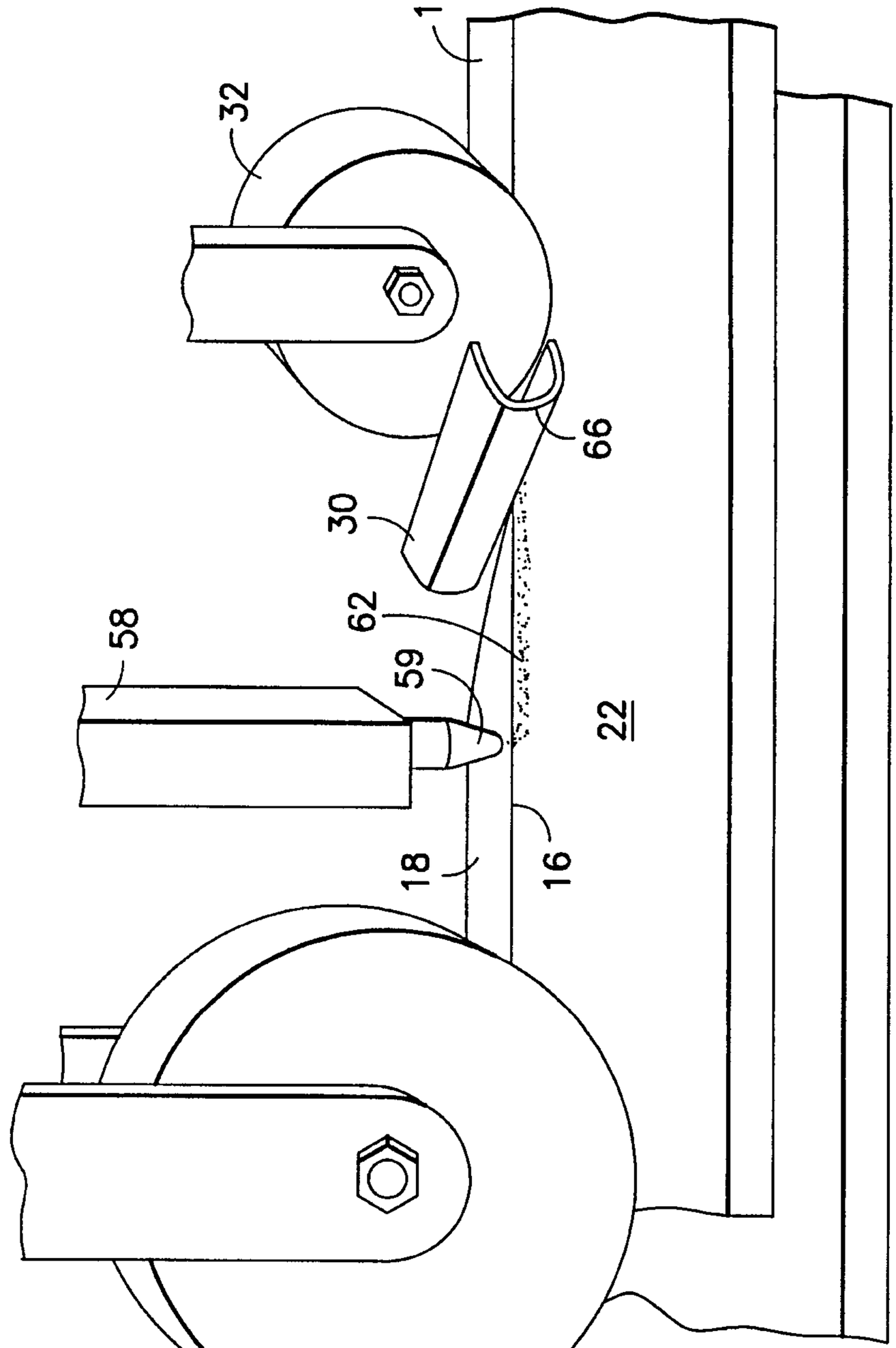


FIG.6

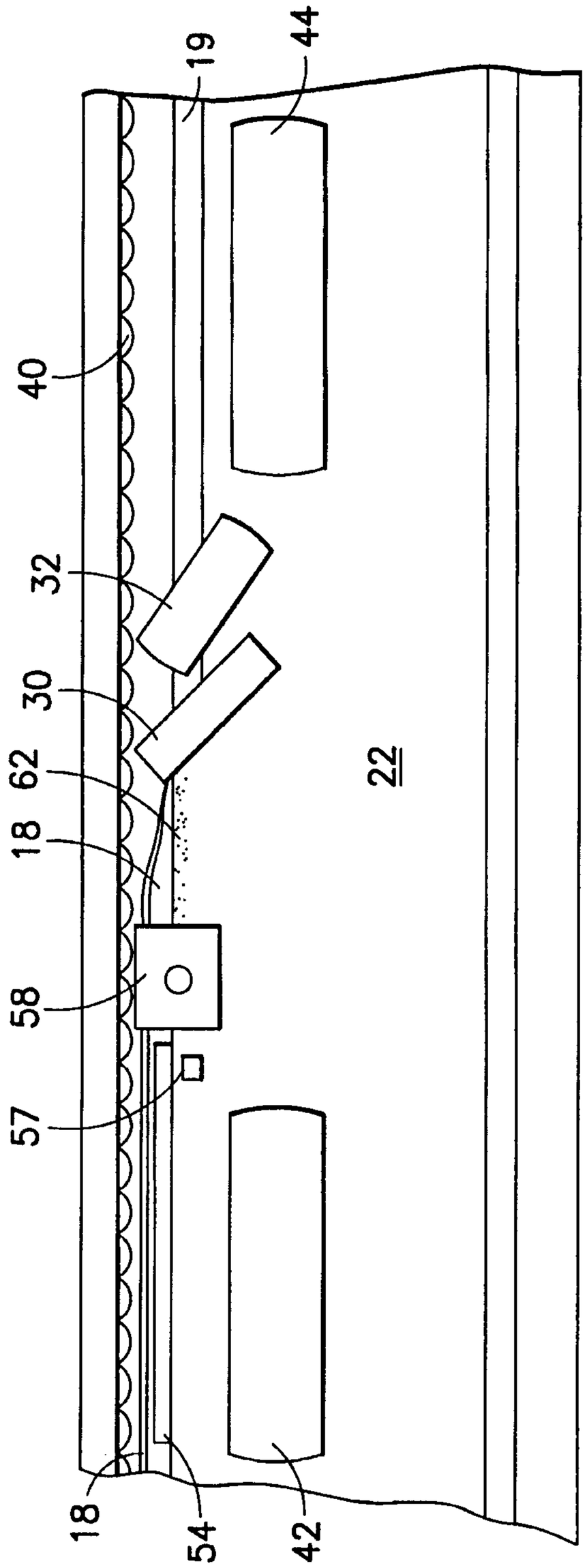
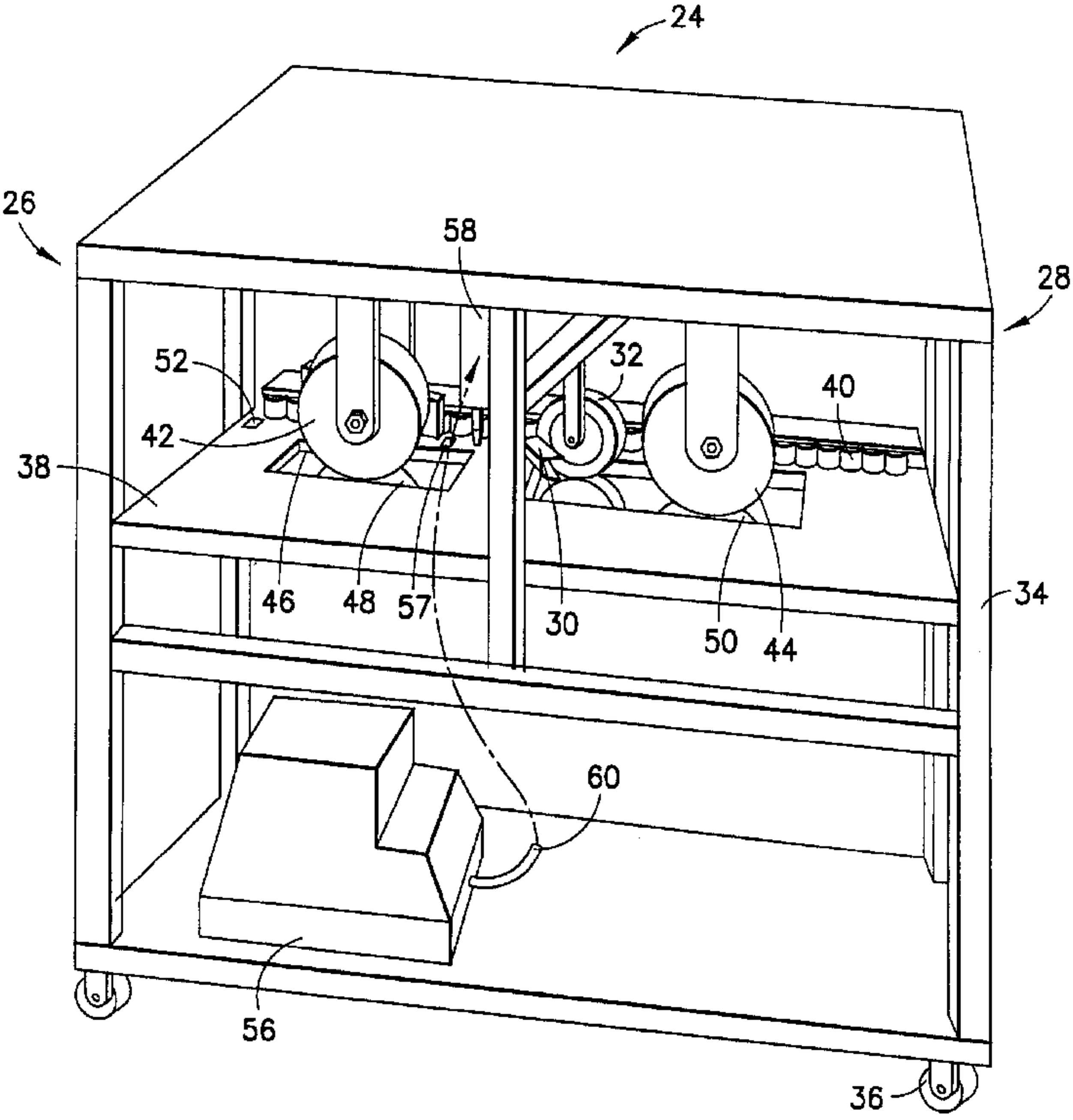


FIG.7


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