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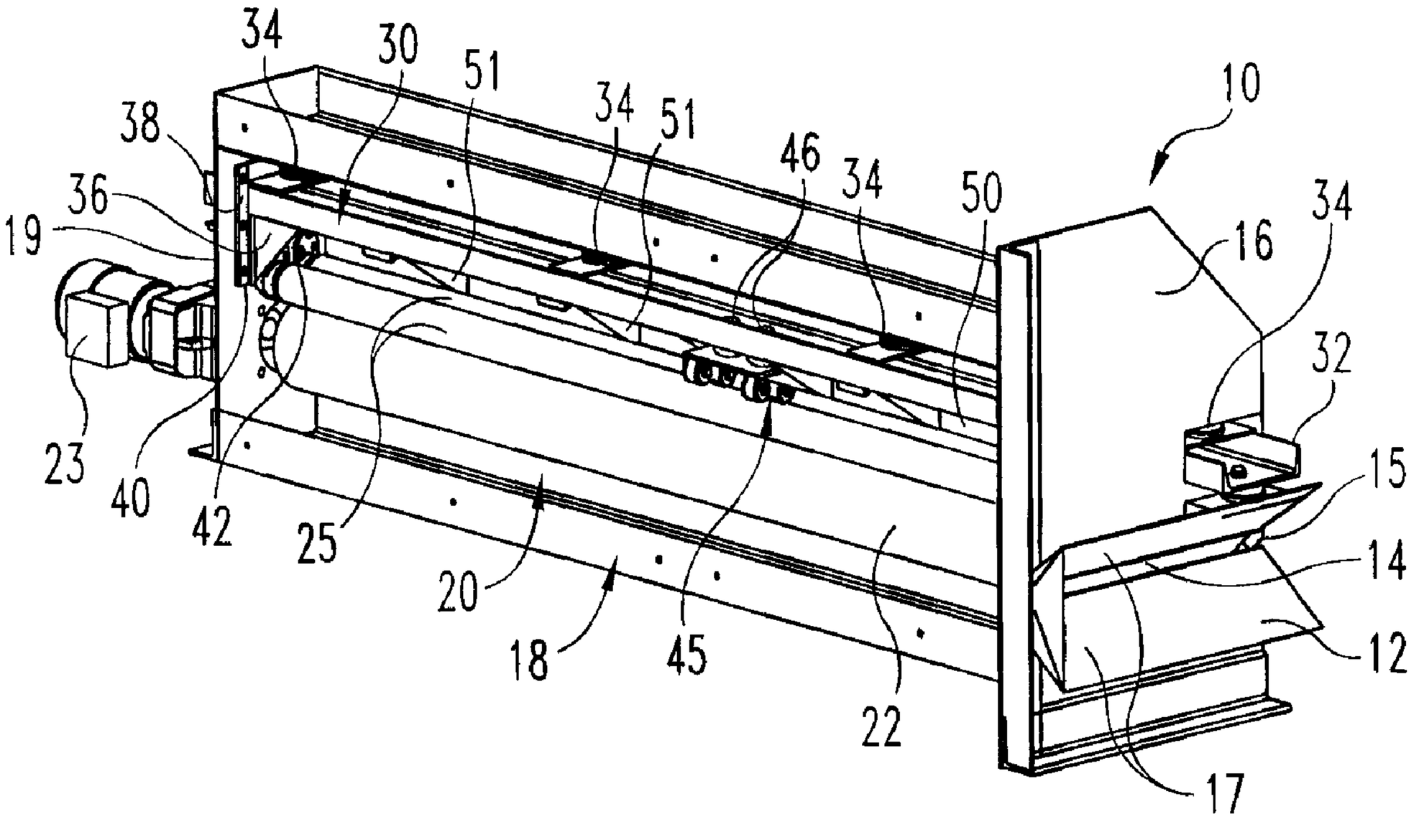
(54) Title: DUNNAGE SHEET REMOVAL APPARATUS



(57) Abrégé/Abstract:
A dunnage removal apparatus is situated adjacent a load conveyor and more particularly at a transfer device that moves a unitized load from the load conveyor to a pre-feeder. The dunnage removal apparatus includes a guide chute that funnels a loose flap of the dunnage sheet toward a sheet stripper mechanism. The mechanism includes a motor driven drive roller and a pair of pinch rollers that pinch the flap and pull the dunnage sheet from beneath the load. The pinch rollers are supported for movement relative to the drive roller to accept dunnage sheet(s) of variable thicknesses. A backstop plate is provided that moves with the pinch rollers. The load bears against the backstop plate as the dunnage sheet(s) is removed.

ABSTRACT OF THE DISCLOSURE

A dunnage removal apparatus is situated adjacent a load conveyor and more particularly at a transfer device that moves a unitized load from the load conveyor to a pre-feeder. The dunnage removal apparatus includes a guide chute that funnels a loose flap of the dunnage sheet toward a sheet stripper mechanism. The mechanism includes a motor driven drive roller and a pair of pinch rollers that pinch the flap and pull the dunnage sheet from beneath the load. The pinch rollers are supported for movement relative to the drive roller to accept dunnage sheet(s) of variable thicknesses. A backstop plate is provided that moves with the pinch rollers. The load bears against the backstop plate as the dunnage sheet(s) is removed.

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DUNNAGE SHEET REMOVAL APPARATUS

Background of the Invention

The present invention relates to systems for the conveyance of unitized loads, such as transfer conveyors. More particularly, the invention pertains to an apparatus for removing a dunnage sheet from beneath a unitized load.

Many products are shipped using waste or dunnage material to protect stacked product. For instance, as shown in **FIG. 1**, dunnage material **D** protects a load **L** that is contained by an array of straps **S**. The load may be, for instance, multiple stacks of sheet material, such as corrugated sheet or paperboard blanks used in making boxes. The corrugated sheets are shipped flat in a stack about 72 inches high. The strap **S** is typically a plastic band that is tightened and clamped about the load stack. When it is desired to remove the load **L** from the waste sheet the straps **S** are typically manually cut and removed as the load travels along a load conveyor (**FIG. 3**).

When the load **L** is sheet material, such as the corrugated sheet mentioned above, dunnage or waste sheets **D** are added to the top and bottom of the load stack. The dunnage sheets **D** are provided to protect the surface and edges of the uppermost and lowermost sheets of the load stack. The dunnage sheets are therefore wider than the load so that the sides of the dunnage sheets **D** may be folded over the edge of the load. In a typical load of sheet material, multiple stacks are supported on one common dunnage array. In this case, the dunnage sheets **D** are sized to cover every stack and the straps **S** are sized and arranged to firmly hold all the stacks together.

When a unitized load of sheet stock is received, the unit is dropped on a load conveyor (**FIG. 3**). As the unitized load progresses along the conveyor, the straps **S** are cut and removed. The top dunnage sheet **D** is also removed so that the load **L** is free and available to be fed to a pre-feeder, as shown in **FIG. 3**. In certain systems, when the load **L** is prepared, a transfer device moves the load

off the load conveyor and onto a transfer conveyor that leads to the sheet pre-feeder. At the pre-feeder, various operations are performed on the load, depending upon the nature of the pre-feeder and downstream processing stations. In some devices, the multiple load stacks are converted to a single stack, the stack(s) is inverted, smaller stacks are removed, etc.

The lower dunnage sheet poses a problem, especially for multiple stack loads. When the straps **S** are removed, the flaps **F** of the bottom dunnage sheet **D** tend to fall away from the load **L**, as shown in **FIG. 2**. Unless the dunnage sheet is removed prior to reaching the pre-feeder, the sheet may foul the operation of the pre-feeder. In most cases, the load **L** is too heavy for manual removal of the bottom dunnage sheet from underneath the load. Thus, an apparatus is required to mechanically remove the dunnage sheet without disturbing the multiple stack load and without unduly disrupting the process flow from the load conveyor to the pre-feeder. In one approach, a reverse running gum belt is situated at the transfer device (**FIG. 3**). A gate is lowered to hold the load L while the reverse running belt spins to slip the dunnage or waste sheet out from under the load. This approach requires essentially stopping the load while the retention gate is lowered and the reverse running belt operated to strip the dunnage sheet. Another problem is that this system typically only removes the lowermost dunnage sheet, so any additional dunnage sheets would remain undisturbed with the load. In another approach, the leading edge of the dunnage or slip sheet projects ahead of the load and is engaged by a mechanism that pulls the slip sheet away from the load as the mechanism is moved out of the path of the load.

What is needed is a dunnage sheet removal apparatus that may be easily integrated into an existing conveyor system and that performs its function without any significant disruption of the process flow from the load conveyor to the pre-feeder. There is a further need for a dunnage sheet removal apparatus that is capable of removing virtually any type and any number of waste sheets.

Summary of the Invention

In view of these needs, the present invention provides a dunnage sheet removal apparatus that initially receives the side flap of the dunnage sheet and grasps that flap to pull the waste sheet out from under the load, all without substantially disturbing the process flow of the unitized load.

An apparatus is provided for removing a dunnage sheet from a unitized load in which a flap of the dunnage sheet extends beyond a side of the unitized load. In one embodiment, the apparatus comprises a guide chute having a mouth sized to receive the flap as the unitized load moves toward the guide chute. The guide chute is configured to funnel the flap to a dunnage slot. The apparatus further comprises a sheet stripper mechanism arranged to receive the flap as it passes through the dunnage slot. The sheet stripper mechanism is operable to pull the flap away from the unitized load.

In one embodiment, the sheet stripper mechanism includes a drive roller, a motor coupled to rotate the drive roller, and at least one pinch roller arranged parallel to the drive roller to pinch the flap therebetween. Preferably, two pinch rollers are provided that are spaced apart above the drive roller. The apparatus may further comprise a support frame with the drive roller rotatably supported on the support frame, and a pinch roller support assembly with the pinch roller(s) rotatably supported thereon. The pinch roller support assembly is supported on the support frame so that the pinch roller is movable to variable positions relative to the drive roller. These variable positions allow the sheet stripper mechanism to clamp onto flap(s)/dunnage sheet(s) of different thicknesses without modification of the apparatus.

In one embodiment, the pinch roller support assembly is configured to move the pinch rollers to the clamping position under influence of the dunnage sheet flaps. In a preferred embodiment, the pinch roller support assembly includes a power element mounted on the support frame and operable to move the pinch roller to a positioning in which it clamps the dunnage sheet against the drive roller. This power element may be an air spring or a pneumatic cylinder

that is operated in response to the dunnage sheet flap being positioned fully within the removal apparatus. As the flap is funneled into the apparatus, the cylinder holds the pinch rollers offset from the drive roller. Once the flap is fully inserted, the cylinder is operable for the pinch rollers to drop into contact with the flap. In a preferred embodiment, the pinch roller support assembly includes resilient upper bushing mounts that push the pinch rollers down into contact with the flap and drive roller.

In a further aspect of the invention, the means for supporting supports a backstop plate for movement with the pinch rollers relative to the drive roller. The backstop plate is contacted by the unitized load as the dunnage sheet is stripped from beneath the load. The backstop plate thus prevents a sheet load from being pulled into the sheet stripper mechanism.

In a further aspect of the invention, a method is provided for removing a dunnage sheet from a unitized load in which a flap of the dunnage sheet extends beyond a side of the unitized load. In one embodiment, the method comprises the steps of guiding the flap into a sheet stripper mechanism, engaging the flap by the sheet stripper mechanism, and operating the sheet stripper mechanism to pull the flap to thereby strip the dunnage sheet from beneath the unitized load. In certain embodiments, the step of guiding the flap includes conveying the unitized load along a conveyor toward the sheet stripper mechanism, and funneling the flap into the sheet stripper mechanism as the load is conveyed toward the mechanism.

In other embodiments, the step of engaging the flap includes pinching the flap between a powered drive roller and at least one pinch roller, and the step of operating the sheet stripper mechanism includes rotating the drive roller to pull the flap to thereby strip the dunnage sheet from beneath the unitized load. The method may also include the step of providing a backstop for the unitized load during the step of operating the sheet stripper mechanism to prevent movement of the load toward the mechanism.

One object of the invention is to provide an apparatus that may be combined with an existing conveyor system to remove the waste or dunnage sheets from beneath a unitized load. One benefit of the present invention is that it is capable of removing dunnage sheets of any number and type. Another benefit is that the apparatus of the present invention can remove the dunnage sheets with almost no interruption in the flow of the load to the next downstream processing station.

Description of the Figures

FIG. 1 is an end view of a unitized load that includes waste or dunnage sheets at the top and bottom of the load.

FIG. 2 is an end view of the unitized load shown in **FIG. 1** with the straps and upper dunnage sheet removed.

FIG. 3 is a top view of a conveyor system integrated with the sheet removal apparatus of the present invention.

FIG. 4 is a rear perspective view of the sheet removal apparatus in accordance with one embodiment of the present invention.

FIG. 5 is a rear elevational view of the sheet removal apparatus shown in **FIG. 4**.

FIG. 6 is a side partial cross-sectional view of the sheet removal apparatus shown in **FIGS. 5** and **7**, taken along line **6-6** as viewed in the direction of the arrows.

FIG. 7 is a front elevational view of the sheet removal apparatus shown in **FIGS. 4-6**.

FIG. 8 is an enlarged cross-sectional view take along line **8-8** in **FIG. 7** as viewed in the direction of the arrows.

FIG. 9 is an enlarged perspective view of the sheet removal apparatus showing the dunnage slot and details of the pinch roller support assembly.

FIG. 10 is an enlarged perspective view of the pressure roller assembly of one embodiment of the sheet removal apparatus shown in **FIG. 4-7**.

Description of the Preferred Embodiments

For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiments illustrated in the drawings and described in the following written specification. It is understood that no limitation to the scope of the invention is thereby intended. It is further understood that the present invention includes any alterations and modifications to the illustrated embodiments and includes further applications of the principles of the invention as would normally occur to one skilled in the art to which this invention pertains.

The present invention contemplates an apparatus **10** that can be integrated into an existing conveyor system, such as the arrangement shown in **FIG. 3**. In accordance with the preferred embodiment, the apparatus **10** is situated adjacent a transfer device that is used to move the unitized load (**FIG. 1**) from the load conveyor to the transfer conveyor. It is understood that prior to reaching the transfer device, the straps **S** and upper dunnage sheet have been removed from the unitized load. Thus, upon arriving at the transfer device the load **L** and dunnage sheet **D** appear as shown in **FIG. 2**. More specifically, the flaps **F** of the dunnage sheet **D** are displaced from the side of the load **L**. When the straps **S** (**FIG. 1**) are removed, the flaps **F** will fall naturally to the position shown in the figure.

The sheet removal apparatus **10** is shown in detail in **FIGS. 4-10**. In general, as seen in **FIG. 4**, the apparatus **10** includes a guide chute **12** that is arranged to open toward the oncoming unitized load (**FIG. 3**). The chute **12** essentially funnels the flap **F** at one side of the dunnage sheet **D** into a dunnage slot **14**. The slot **14** has an open mouth **15** facing the load conveyor so that the dunnage sheet **D** can slide into the slot **14** as the load travels along the conveyor. The mouth of the chute **12** is defined by the angled walls **17** projecting from the side wall **16**. The width of the mouth of the chute is preferably slightly greater than twice the extent of the flap **F**. The leading edge of the flap **F** will thus be guaranteed to contact one of the chute walls **17** as the load moves

toward the transfer device and the sheet removal apparatus **10**. As the load moves closer, the angled walls direct the leading edge of the flap **F** into the slot **14**.

The apparatus **10** includes a primary frame **18** that supports the side wall **16** as well as a sheet stripper mechanism **20** that is operable to grab the flap **F** of the dunnage sheet and pull the flap to remove the sheet from underneath the load **L**. The sheet stripper mechanism includes a drive roller **22** that is rotated by a motor **23** supported on a side wall **19** of the frame **18**. The drive roller **22** is rotatably supported between the side walls **16** and **19** and is aligned to rotate about an axis parallel to the path of the load, dunnage sheet **D** and flap **F**. The roller is arranged so that the upper extent of the roller is generally aligned with the lower edge of the dunnage slot **14**, as best shown in **FIG. 6**.

A pair of pinch rollers **25** are rotatably supported directly above the drive roller **22**. The rollers **25** are separated from each other but are arranged to be in contact with the drive roller **22** flanking the vertical centerline **CL** of the roller. Thus, as shown in **FIG. 6**, the point of initial contact between the pinch rollers **25** and the drive roller **22** is slightly below the lower edge of the dunnage slot **14**. The pinch rollers are arranged to pinch the dunnage sheet flap between the pinch rollers and the drive roller.

While the pinch rollers **25** may contact with the drive roller, the pinch rollers are supported on the primary frame **18** so that the rollers can be displaced away from the surface of the drive roller as the dunnage sheet, or sheets, pass therebetween. Thus, the pinch rollers **25** are supported by a support assembly **30** that is connected to the primary frame **18**. In one embodiment, the support assembly includes a channel beam **32** that is connected to the frame **18** by way of several power elements **34**, as best shown in **FIGS. 5** and **7**. In the preferred embodiment, the power elements are air springs. The channel beam **32** projects beyond the sides of the frame **18** and is supported at these outboard positions by lower bushing mounts **55** carried by a corresponding mounting flange **54** fixed to the primary frame **18**.

The air springs **34** and bushing mounts **55** support the channel beam **32** so that it can translate in the vertical direction relative to the drive roller **22**. Thus, in one embodiment, as the dunnage sheet moves into contact with the drive roller **22**, it slips between the drive roller and the pinch rollers **25**, causing the pinch rollers to move upward, displacing the air springs **34**. The air springs **34** are pressurized to maintain a substantially constant pressure between the drive roller and the pinch rollers to ensure that the rotation of the drive roller will impart a lateral force to the dunnage sheet. As shown in **FIG. 4**, the back side of the apparatus **10** (i.e., the side facing away from the conveyor) is open so that as the dunnage sheet is pulled by rotation of the drive roller the dunnage sheet is ejected onto the floor or into a waste sheet bin adjacent the apparatus.

The vertical movement of the pinch roller support assembly **30** is guided at opposite sides of the apparatus **10** by a corresponding guide flange **36** that is slidably positioned within a guide slot **40**. The guide slot **40** is formed by two guide brackets **38**, **39** mounted to the side walls of the primary frame **18**, as most clearly shown in the enlarged view of **FIG. 9**. As shown in the figure, the guide flange **36** is configured to remain clear of the dunnage slot **14** and of the pinch rollers **25** so as not to interfere with the passage of the dunnage sheet(s) between the drive and pinch rollers. The guide flanges **36** are fixed to corresponding side support plates **42** that carry bearing mounts **43** that rotatably support the two pinch rollers **25**.

To provide intermediate support for the pinch rollers **25**, the apparatus **10** further includes a pressure roller assembly **45** situated generally at the middle of the length of the rollers. The pressure roller assembly **45** is carried on the channel beam **32** by a pair of bushing mounts **46** to permit a limited amount of vertical play. The assembly **45** includes two sets of three pressure rollers **48**, with one of the rollers in each set situated between the two pinch rollers **25**, as shown in the enlarged view of **FIG. 10**.

The pinch roller support assembly **30** further includes a front plate **50** that is fastened to the channel beam **32**. The front plate **50** is arranged to face the

load **L** as is moves next to the sheet removal apparatus **10**. Stiffening ribs **51** are provided between the channel beam **32** and the plate **50** to add strength to the support assembly. More particularly, the front plate **50** is arranged to block movement of the load **L** as the dunnage sheet **D** is stripped from beneath the load by the rollers **22**, **25**. Thus, the ribs **51** add stiffness to the front plate so that the plate does not bend or buckle under pressure from the load.

The lower edge of the front plate **50** preferably terminates above the upper edge of the dunnage slot **14** so that the plate does not interfere with the dunnage sheet. However, in order to ensure that a load sheet cannot move between the rollers, a backstop plate **60** is adjustably mounted to the front plate **50** by an adjustable mounting arrangement **62**. As shown in the detail view of **FIG. 8**, the mounting arrangement **62** includes a cap screw **64** projecting from the backstop plate **60**. The cap screw **62** extends through a slot **69** defined in a guide plate **68** mounted to the front plate **50**. The front plate includes a corresponding slot (not shown) that aligns with the slot **69**. A locking cap **66** mates with the end of the cap screw **64** to hold the backstop plate **60** to the front plate **50**. The cap screw **64** is configured to slide within the slot **69** as the backstop plate **60** moves up and down in response to the passage of a dunnage sheet through the apparatus.

The backstop plate **60** includes a lower edge **72** (**FIGS. 6-8**) that is preferably situated slightly below the line of contact between the pinch rollers **25** and the drive roller **22** and is also slightly below the lower edge of the dunnage slot **14**. The end of the backstop plate facing the incoming unitized load includes a beveled edge **71** that is first contacted by the dunnage sheet. As the dunnage sheet travels further into the removal apparatus **10**, the dunnage sheet lifts the backstop plate **60** up, while the plate maintains constant contact with the dunnage sheet. The backstop plate thus prevents a sheet in the load stack from passing underneath the plate **60** and into contact with the rollers **22**, **25**.

In one embodiment, the pinch rollers **25** and their associated support assembly **30**, and the backstop plate **60**, may be configured to move with the dunnage sheet **D** as it is conveyed through the dunnage slot **14** and between the

drive roller **22** and the front pinch roller **25**. Once the dunnage sheet has traveled across the front face of the apparatus **10**, the drive motor **23** is activated to cause the drive roller **22** to rotate. Rotation of the drive roller **22** pulls the flap **F** of the dunnage sheet, and ultimately the entire dunnage sheet **D**, from the unitized load. The backstop plate **60** holds the load stack while the dunnage sheet is stripped. Once the sheet has been removed, the drive motor **23** is deactivated and the transfer device is activated to move the load along the transfer conveyor. Alternatively, the transfer device can be activated in due course once the flap **F** is grasped by the drive and pinch rollers. In this way, the movement of the load **L** away from the apparatus **10** facilitates removal of the dunnage sheet from the load.

In the most preferred embodiment, the pinch roller support assembly is powered to be raised and lowered during operation of the sheet removal apparatus **10**. Thus, in this preferred embodiment, the lower bushing mounts **55** are replaced with power components, such as air springs, that operate to push the channel beam **32** upward away from the drive roller **22**, and preferably above the upper edge of the dunnage slot **14**. With this embodiment, a gap is created between the drive roller **22** and the pinch rollers **25** so that the dunnage sheet **D** may pass freely between the rollers. Once the dunnage sheet has reached the opposite end of the apparatus **10**, the power components at the bushing mounts **55** are controlled to lower the pinch rollers onto the drive roller and to correspondingly lower the backstop plate **60** into its sheet removal position. When the pressure is relieved in the air springs, the upper air springs **34** push the pinch roller support assembly **30** down into the sheet stripping position.

In the preferred embodiment, the power components are air springs that are connected to a separate air source (not shown). While air springs are preferred because of their simplicity and responsiveness, other power components may be considered, such as pneumatic cylinders and electric motors.

It can be seen with the above embodiments that the apparatus **10** can accommodate any type, thickness and number of dunnage sheet(s). The pressure maintained between the pinch rollers **25** and the drive roller **22** is sufficient to grasp and remove most types of dunnage sheets without difficulty.

Operation of the sheet removal apparatus **10** may be governed by sensors that sense when a unitized load is approaching, when the flap **F** of a dunnage sheet **D** has entered the chute **12** and/or when the dunnage sheet has traveled the length of the apparatus **10** so that the sheet is fully within the apparatus. In addition, a sensor may be used to detect when the dunnage sheet has been completely stripped from the unitized load. Optical sensors may be used for all of these functions and may be tied to a controller that controls the activation/de-activation of the motor **23** as well as the operation of the air springs **34** and **55**. The controller may be any known microprocessor or electrical control system that is capable of activating and de-activating the apparatus components in a pre-determined sequence and in response to signals from the sensors.

The dunnage sheet removal apparatus **10** is configured to mate with an existing conveyor system, and most particular for a conveyor system adapted for transporting unitized loads of sheet material. The length of the apparatus, and more particularly of the drive roller **22,** is sized according to the width of the dunnage sheets being processed. In a typical installation, the drive roller is 96 inches wide to accept a standard dunnage sheet. The dunnage sheet may be of a variety of materials and thicknesses. The drive roller **22** and pinch rollers **25** may include a variety of outer surfaces that are adapted for gripping a sheet of paper or corrugated material. In one embodiment, the rollers have a rubber or tackified surface.

While the invention has been illustrated and described in detail in the drawings and foregoing description, the same should be considered as illustrative and not restrictive in character. It is understood that only the preferred embodiments have been presented and that all changes, modifications and

further applications that come within the spirit of the invention are desired to be protected.

For instance, in the illustrated embodiment, the dunnage removal apparatus is situated at a right angle configuration between the load conveyor and the pre-feeder. In an alternative configuration, load can be transferred from a transfer car onto a reversing conveyor segment with the removal apparatus at the opposite end of the segment. The reversing conveyor then transfers the load and dunnage sheet to the mechanism where the dunnage sheet is removed, and then returns the load to the intake end of the conveyor segment where it is ready to be transferred to the pre-feeder.

It is also understood that the dunnage sheet removal apparatus may also be used to remove a dunnage sheet from between a load and a pallet carrying the load. With this variation, the positioning of the guide chute of the apparatus would be adjusted to account for the change in height of the dunnage sheet relative to the conveyor.

What is claimed is:

1. An apparatus for removing a dunnage sheet from a unitized load in which a flap of the dunnage sheet extends beyond a side of the unitized load, the apparatus comprising:

a guide chute having a mouth sized to receive the flap as the unitized load moves toward said guide chute, said guide chute configured to funnel said flap to a dunnage slot; and

a sheet stripper mechanism arranged to receive the flap as it passes through said dunnage slot and operable to pull the flap away from the unitized load.

2. The apparatus of claim 1, wherein said sheet stripper mechanism includes:

a drive roller;

a motor coupled to rotate said drive roller; and

at least one pinch roller arranged parallel to said drive roller to pinch the flap therebetween.

3. The apparatus of claim 2, wherein said apparatus further comprises:

a support frame, said drive roller rotatably supported on said support frame; and

a pinch roller support assembly, said at least one pinch roller rotatably supported thereon, said pinch roller support assembly supported on said support frame so that said at least one pinch roller is movable relative to said drive roller.

4. The apparatus of claim 3, wherein said pinch roller support assembly includes a power component mounted on said support frame and operable to move said at least one pinch roller relative to said drive roller.

5. The apparatus of claim 2, wherein said sheet stripper mechanism includes a second pinch roller arranged parallel to said at least one pinch roller and to said at drive roller to pinch the flap therebetween.

6. The apparatus of claim 1, further comprising:

a support frame; and

means for supporting said sheet stripper mechanism on said support frame to receive the dunnage sheet flap as it passes through said dunnage slot.

7. The apparatus of claim 6, wherein:

said sheet stripper mechanism includes:

a drive roller;

a motor coupled to rotate said drive roller; and

at least one pinch roller arranged parallel to said drive roller to pinch the flap therebetween; and

said means for supporting said sheet stripper mechanism supports said drive roller in a fixed position relative to said dunnage slot and supports said at least one pinch roller for movement relative to said drive roller.

8. The apparatus of claim 7, further comprising a backstop plate carried by said sheet stripper mechanism and arranged to contact the unitized load as said dunnage sheet is pulled away from the unitized load.

9. The apparatus of claim 8, wherein said means for supporting supports said backstop plate for movement with said at least one pinch roller relative to said drive roller.

10. The apparatus of claim 7, wherein said means for supporting includes a pinch roller support assembly including:

a pair of guide slots defined on opposite side walls of said support frame;

a pair side support plates, one each adjacent a corresponding one of said side walls, said side support plates rotatably supporting opposite ends of said at least one pinch roller; and

a pair of guide flanges, one each attached to a corresponding one of said side support plates, each of said guide flanges configured for sliding engagement within a corresponding one of said pair of guide slots, whereby said at least one pinch roller is movable relative to said drive roller as said guide flanges slide within said guide slots.

11. The apparatus of claim 10, wherein said pinch roller support assembly further includes:

an elongated beam connected at its opposite ends to a corresponding one of said pair of side plates; and

at least one air spring connecting said beam to said support frame, said air spring operable to move said elongated beam toward said drive roller.

12. The apparatus of claim 11, wherein said pinch roller support assembly further includes at least one lower resilient bushing connecting said beam to said support frame, said lower resilient bushing operable to resist movement of said elongated beam toward said drive roller.

13. The apparatus of claim 11, wherein said pinch roller support assembly further includes at least one power element connecting said beam to said support frame, said power element operable to move of said elongated beam away said drive roller to thereby move said at least one pinch roller away from said drive roller to define a gap for receiving the flap of the dunnage sheet.

14. The apparatus of claim 11, further comprising a backstop plate adjustably supported by said beam and arranged to contact the unitized load as said dunnage sheet is pulled away from the unitized load.

15. The apparatus of claim 1, further comprising a backstop plate carried by said sheet stripper mechanism and arranged to contact the unitized load as said dunnage sheet is pulled away from the unitized load.

16. A method for removing a dunnage sheet from a unitized load on a conveyor in which a flap of the dunnage sheet extends beyond a transverse side of the unitized load relative to the direction of travel of the load along a conveyor path, the method comprising:

guiding the flap into a sheet stripper mechanism;

engaging the flap by the sheet stripper mechanism; and

operating the sheet stripper mechanism to pull the flap to thereby strip the dunnage sheet from beneath the unitized load.

17. The method of claim 16, wherein the step of guiding the flap includes:

conveying the unitized load along a conveyor toward the sheet stripper mechanism; and

funneling the flap into the sheet stripper mechanism as the load is conveyed toward the mechanism.

18. The method of claim 16, wherein:

the step of engaging the flap includes pinching the flap between a powered drive roller and at least one pinch roller; and

the step of operating the sheet stripper mechanism includes rotating the drive roller to pull the flap to thereby strip the dunnage sheet from beneath the unitized load.

19. The method of claim 16, further comprising the step of providing a backstop for the unitized load during the step of operating the sheet stripper mechanism to prevent movement of the load toward the mechanism.

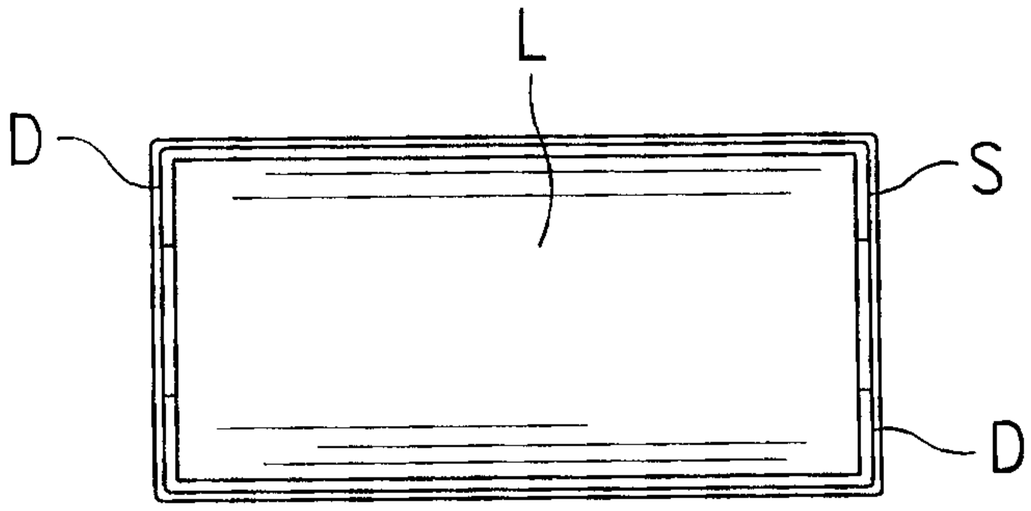

Fig. 1

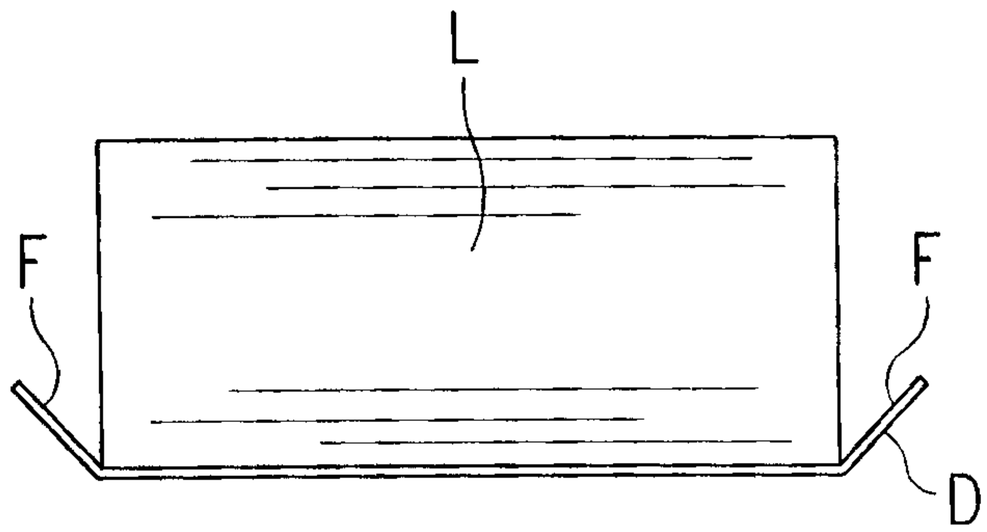

Fig. 2

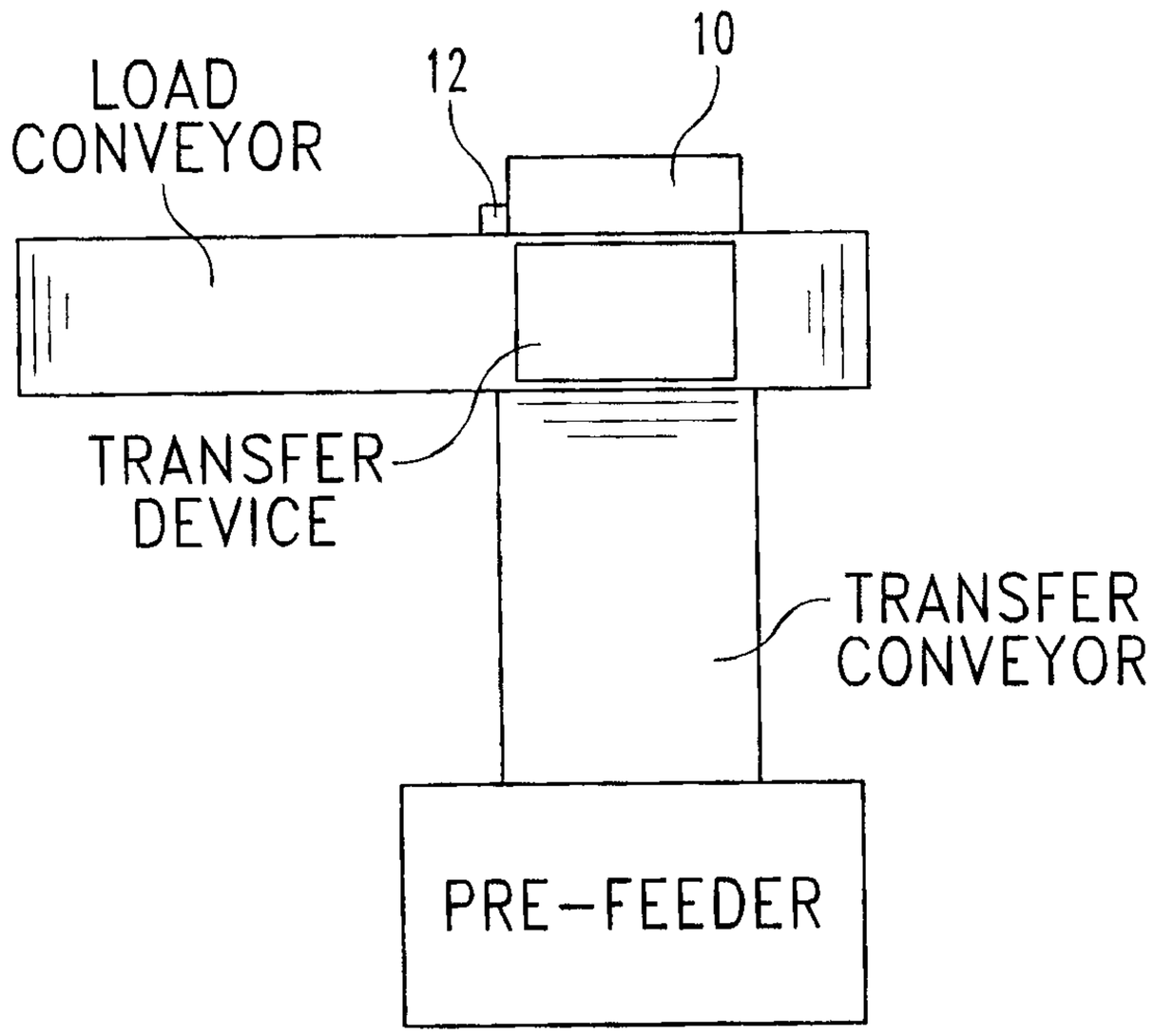

Fig. 3

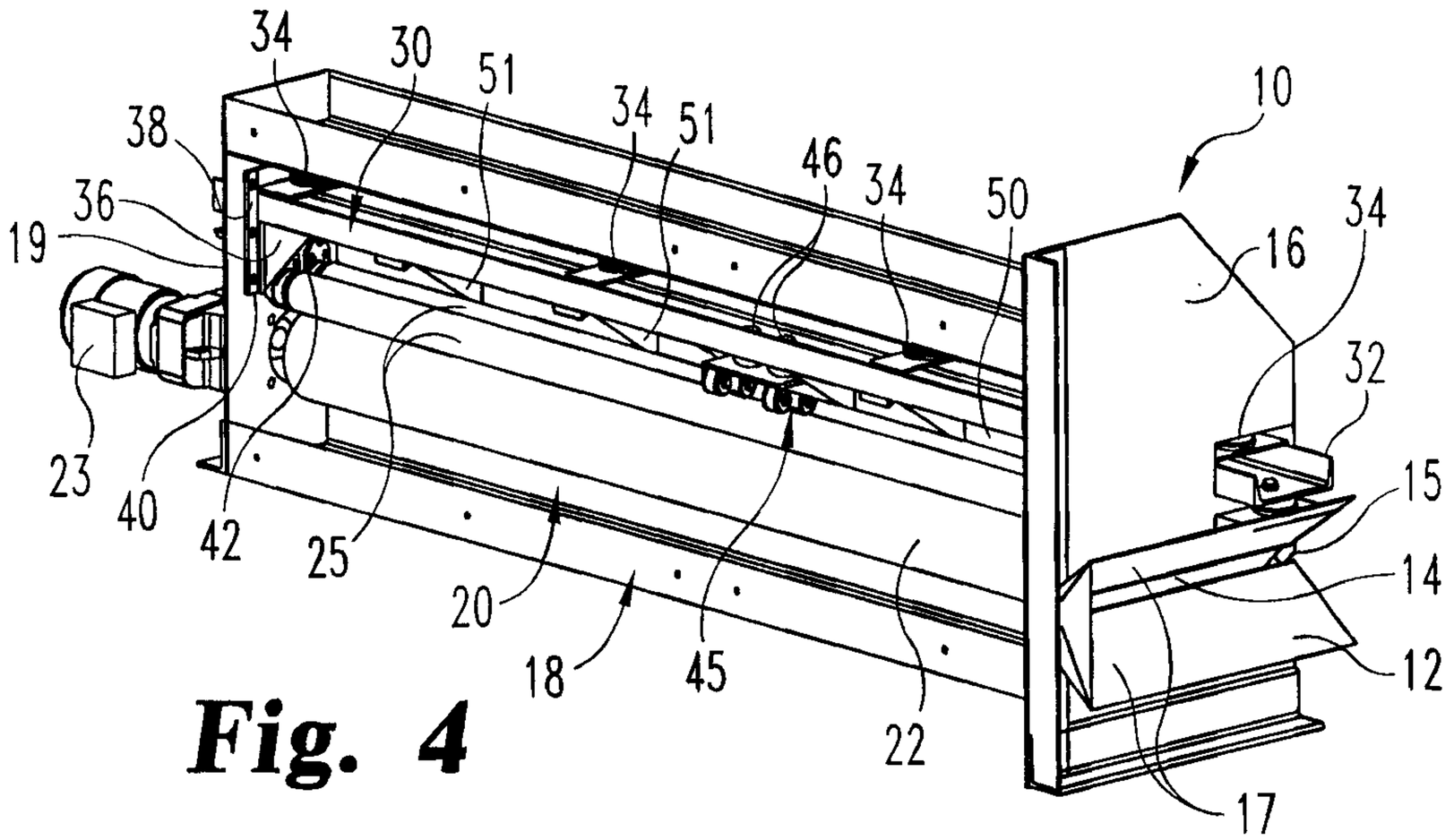

Fig. 4

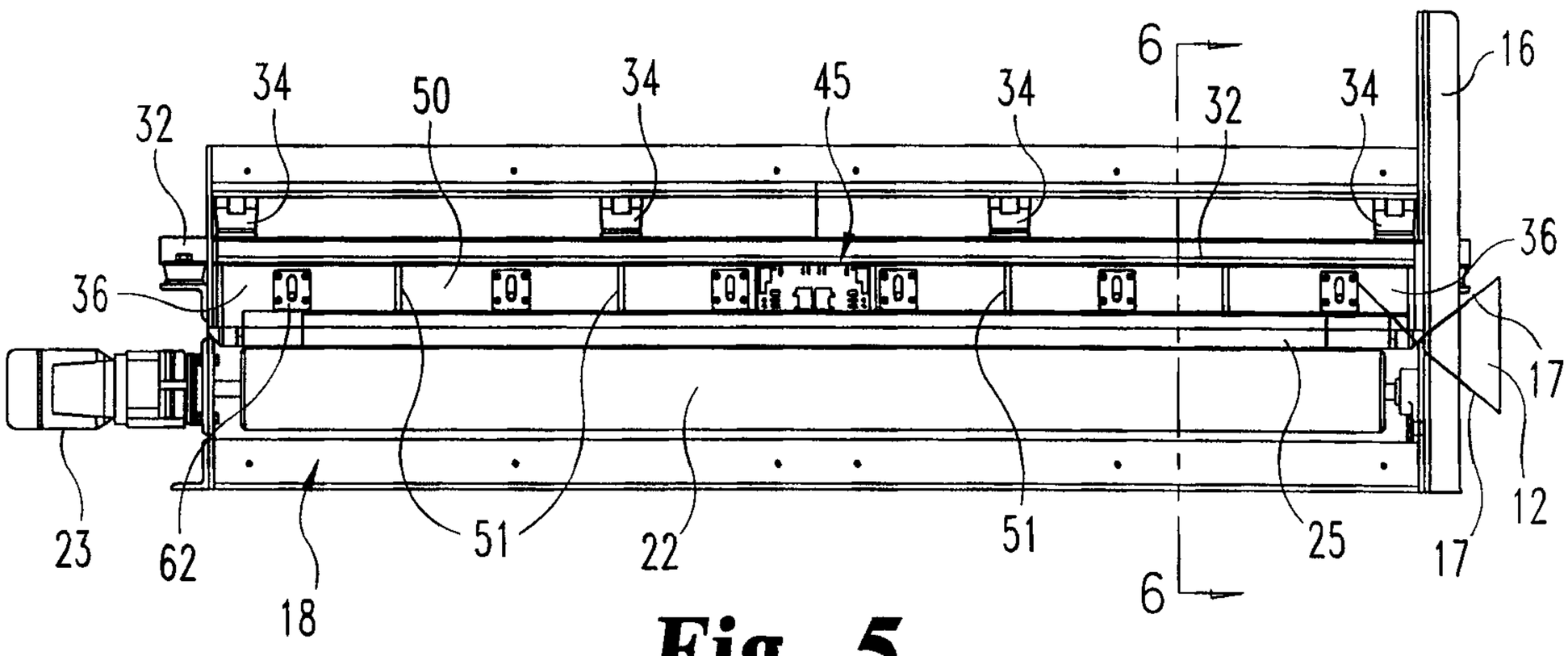

Fig. 5

Fig. 6

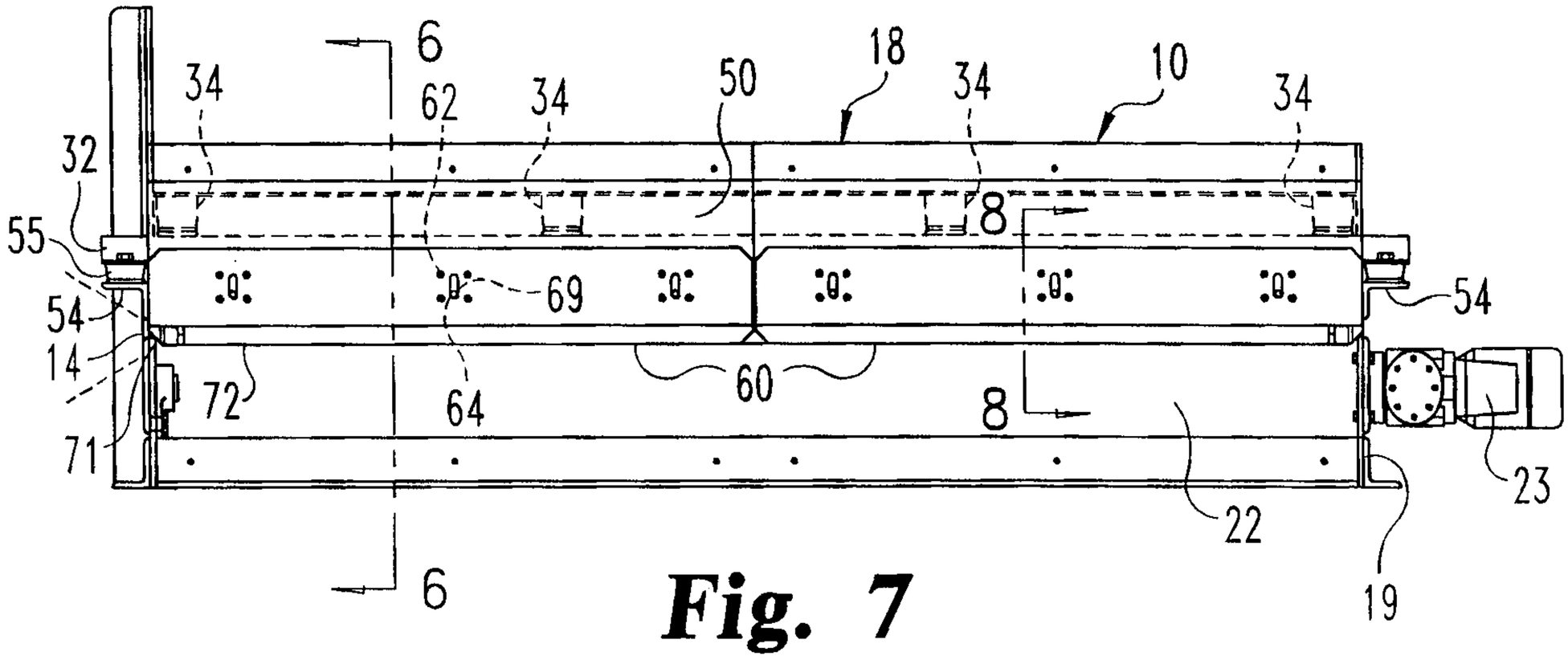
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Fig. 7

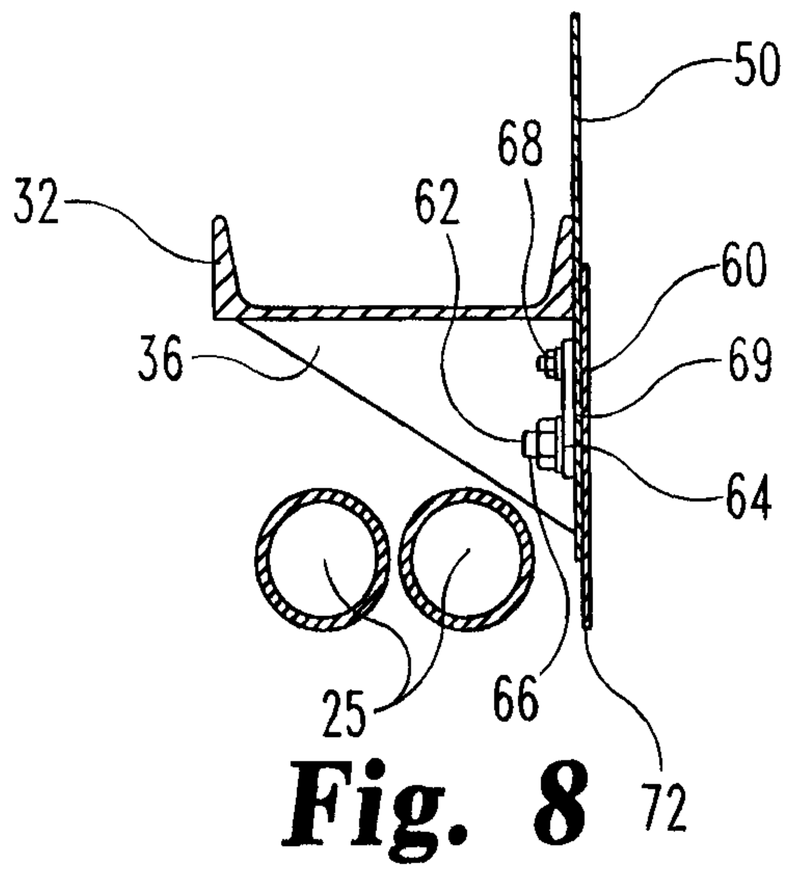
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Fig. 8

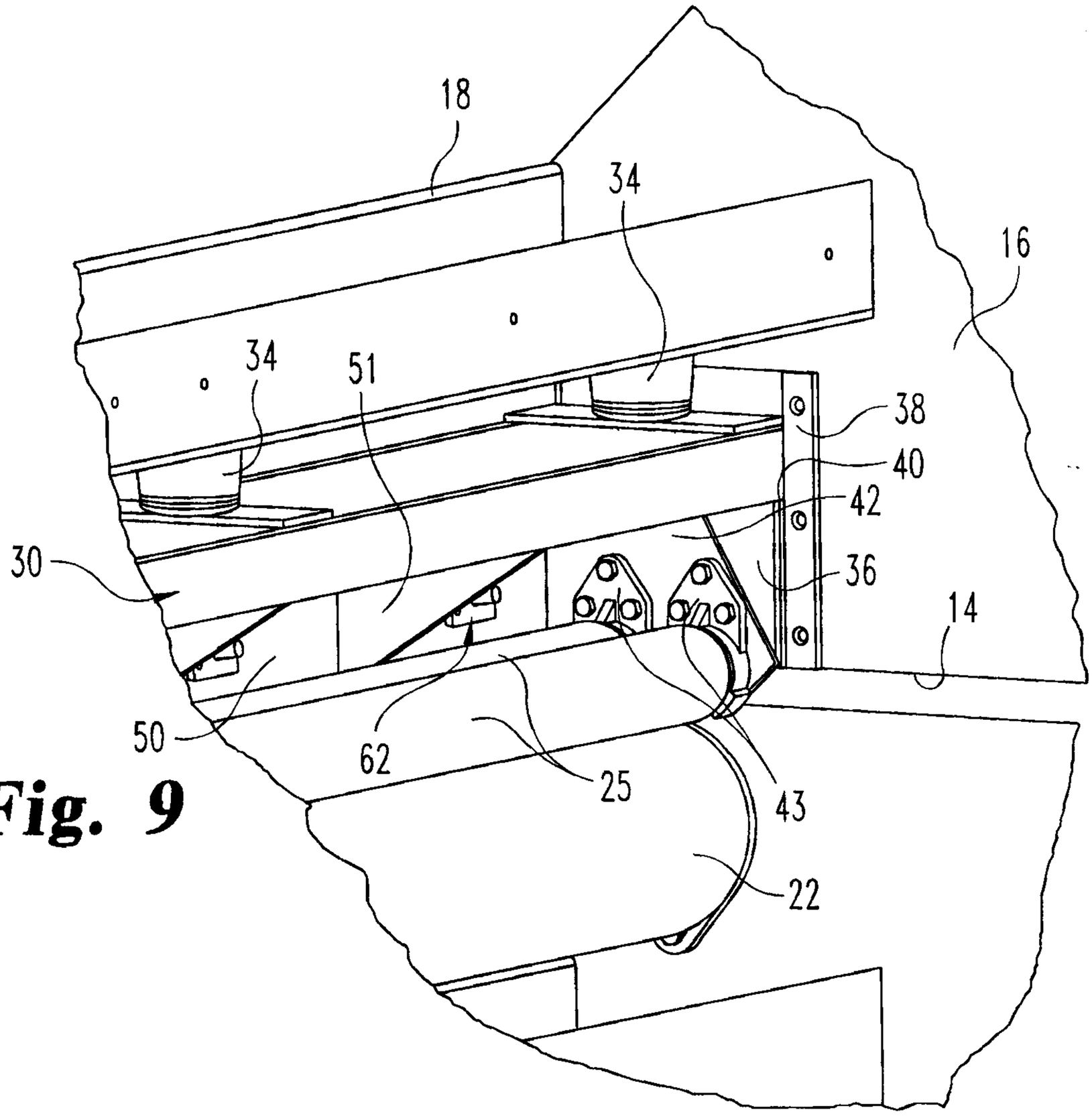
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Fig. 9

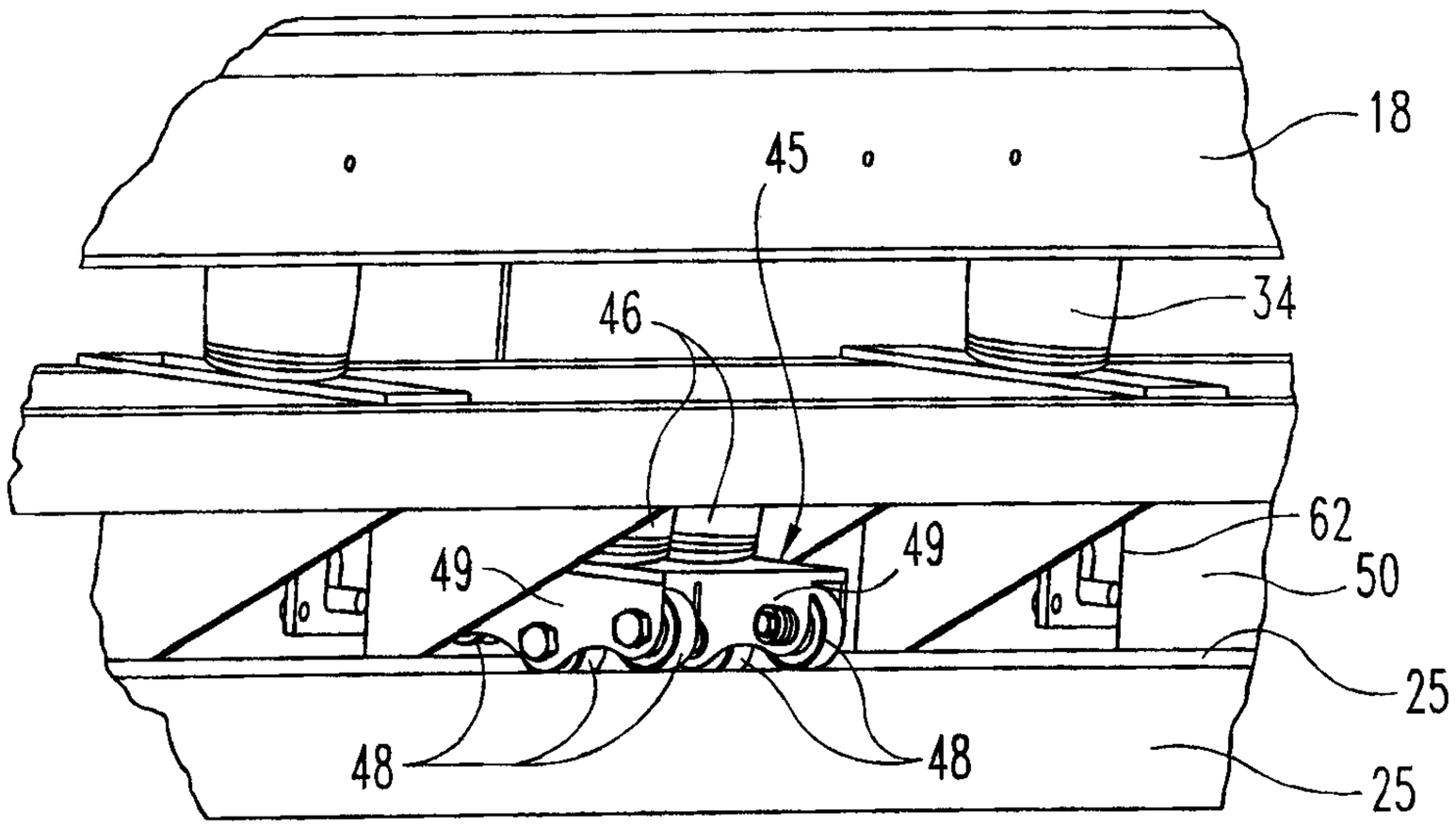
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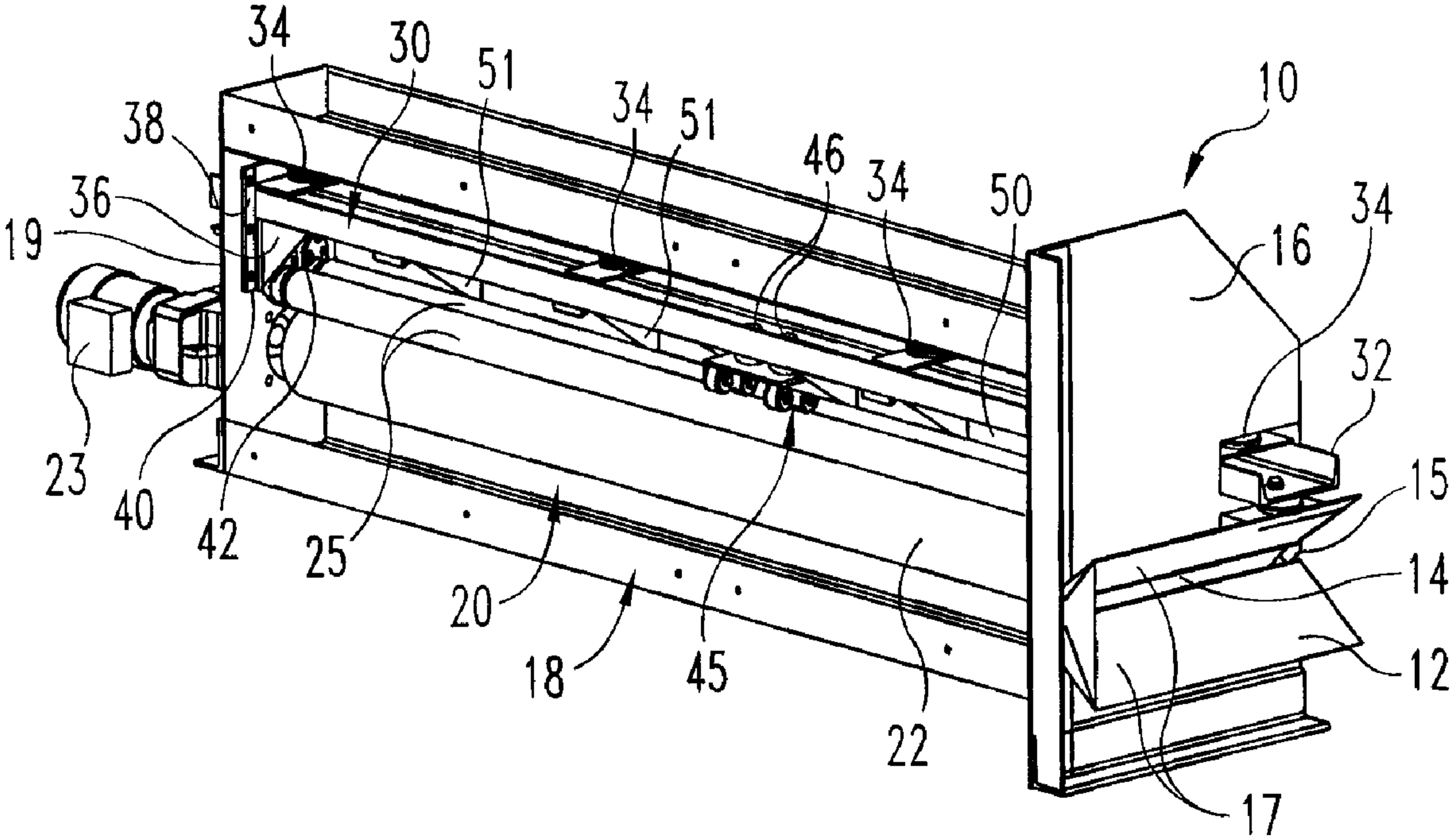
Fig. 10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