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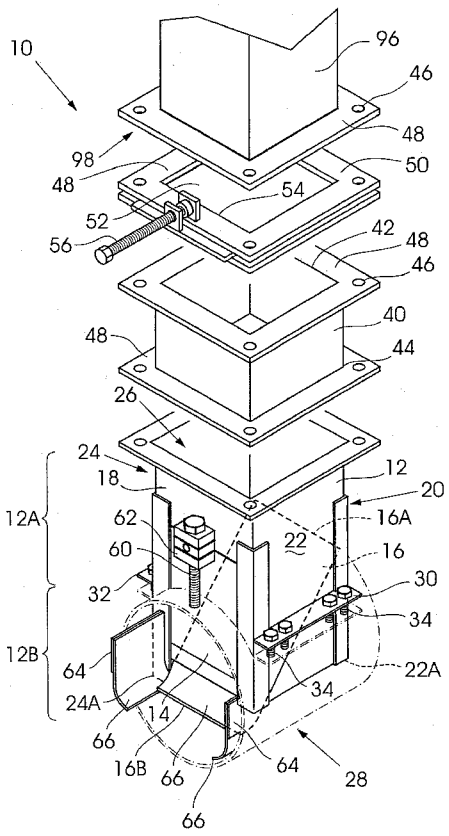

(57) Abstract: This invention relates to a feeder. More specifically, the invention relates to a secure feeder for feeding material onto a conveyor belt enclosed in a pipe, generally known as a pipe conveyor, preventing access to the material being transported thereby. The feeder includes a container, a flow regulating member and a flow restricting member. The container defines a loading end for receiving material and a discharge end for discharging material into the conveyor belt. In use, the flow regulating member regulates the flow of material through the discharge end of the container while the flow restricting member restricts the flow of material deposited on the conveyor belt to an upstream-to-downstream direction thereby preventing the backflow of material in an opposite downstream-to-upstream direction. Furthermore, the flow restricting member comprises a free end positionable in use in contact or close proximity with the conveyor belt.

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FEEDER

BACKGROUND OF THE INVENTION

THIS invention relates to a feeder. More specifically, the invention relates to a secure feeder for feeding material onto a conveyor belt enclosed in a pipe, generally known as a pipe conveyor, preventing access to the material being transported thereby.

Feeders or hoppers for feeding material onto conveyors are well known. However, pipe conveyors have not been available for as long as open-type conveyors and as such, feeders or hoppers for pipe conveyors have much room for improvement.

Accordingly, it is an object of the present invention to provide a feeder for pipe conveyors providing both the ability to regulate flow rate of material being discharged onto the conveyor belt and the ability to provide a barrier to material from rolling upstream, i.e. in a direction opposite to the direction of travel of the conveyor belt, particularly in inclined pipe conveyor applications.

For the purposes of this description, the direction in which a conveyor belt travels will be referred to as the upstream-to-downstream direction, whereas the direction opposite the direction of travel of the conveyor belt will be referred to as the downstream-to-upstream direction, regardless of the inclination of the conveyor belt and/or the pipe in which the conveyor belt is enclosed.

SUMMARY OF THE INVENTION

According to the invention there is provided a feeder for feeding material onto a conveyor belt enclosed in a pipe and travelling in an upstream-to-downstream direction, the feeder including:

a container having a loading end for receiving the material and a discharge end for discharging the material onto the conveyor belt;

a flow regulating member for regulating the flow of material through the discharge end of the container, the flow regulating member being movable relative to the container; and

a flow restricting member for in use restricting the flow of material deposited on the conveyor belt to the upstream-to-downstream direction thereby preventing the backflow of material in an opposite downstream-to-upstream direction, the flow restricting member having a free end positionable in use in contact or close proximity with the conveyor belt.

Preferably, the feeder further includes a spacer member positionable in use between the loading end of the container and a discharge end of a feed source, the spacer member having a height to provide, when removed from the container, sufficient space between the container and the feed source for the feeder to be lifted and removed from the pipe for general maintenance, repair and/or replacement.

The loading end of the container generally defines a mouth into which a discharge end of the spacer member is receivable, or to which the discharge end of the spacer member is releasably attachable by correspondingly engageable flanges on the loading end of the container and the discharge end of the spacer member.

A loading end of the spacer member may define a mouth into which a discharge end of the feed source is receivable, or to which the discharge end of the feed source is releasably attachable by correspondingly engageable flanges on the loading end of the spacer member and the discharge end of the feed source.

Typically, the feeder includes a secondary flow regulating member for regulating the flow of material from the feed source to the container, the secondary flow regulating member being locatable on the discharge end of the feed source and in use operatively above the spacer member enabling, with the secondary flow regulating member in a closed position thereby shutting off flow from the feed source, removal of the spacer member. Preferably, the secondary flow regulating member is a knife valve. More preferably, the feed source is from a group of feed sources including hoppers, bins, feed ducting or feed piping.

In one embodiment, the container may include mounting formations for mounting the feeder over a feeder receiving opening defined in the pipe in which the conveyor belt is enclosed. Generally, the mounting formations comprises mating plates extending from one or more sides of the container, the mounting plates being correspondingly contoured to corresponding mounting plates fixed to the pipe or to an outside surface of the pipe directly. Preferably, the mounting formations include a means for adjusting the height of the feeder relative to the pipe and/or conveyor belt.

In another embodiment, where the feeder is to fitted over an exposed portion of the conveyor belt between a drive or idler pulley and the respective end of the pipe conveyor, the feeder comprises mounting plates extending from one or more sides of the container, the mounting plates being co-operative with a mounting cradle on which the feeder is mountable. Preferably, the feeder and the mounting cradle, independently or jointly, include a means for adjusting the height of the feeder relative to the conveyor belt.

Generally, the mounting formations comprises mating plates extending from one or more sides of the container, the mounting plates being correspondingly contoured to corresponding mounting plates fixed to the pipe or to an outside surface of the pipe directly. Preferably, the mounting formations include a means for adjusting the height of the feeder relative to the pipe

The height adjusting means may be manual and in the form of a plurality of threaded height adjusting rods extending between the mounting formations on the container of the feeder and the pipe. The threaded height adjusting rods are preferably co-operative

with a threaded height adjusting female formation on the mounting formations on the feeder and/or on the corresponding mounting plates on the pipe to translate a rotary motion imparted on the threaded height adjusting rods and/or the threaded height adjusting female formation into an up and down movement of the feeder relative to the pipe. Preferably, the feeder is releasably lockable at the required height by one or more threaded locking rods being co-operative with corresponding threaded locking female formations.

Typically, the threaded height adjusting rods and the threaded locking rods are bolts, and the threaded adjusting female formation and threaded locking female formations are nuts or threaded apertures on the mounting formations of the feeder and/or on the corresponding mounting formations on the pipe.

As an alternative to manual height adjusting means, the height adjusting means may be automatic and in the form of hydraulically, pneumatically or electrically actuated height adjusting members extending between the mounting formations on the container of the feeder and the pipe. The automatic height adjusting means may be operated locally or remotely.

The container comprises: a front end wall; an opposing rear end wall; and opposing side walls extending between the front and rear end walls. Typically, the mounting formations are fixed to one or more of the end and/or side walls at a location between the loading and the discharge ends of the container so as to divide the container mounted in use to the pipe into an upper container portion, being that portion of the container extending operatively above the pipe, and a lower container portion, being that portion of the container extending into and concealed from view by the pipe, such that in use operatively lower terminal edges of the opposing side walls of the lower container portion are located in contact or close proximity with the conveyor belt.

The rear end wall of the lower container portion may define a flow through opening over which the flow restricting member is moveble between a non-restricting open position and a restricting closed position.

In the non-restricting open position, an operatively lower terminal edge of the flow restricting member is in use raised into a spaced apart relationship with the conveyor belt so as in use to allow material travelling on the conveyor belt to pass beneath the feeder. In the restricting closed position, the operatively lower terminal edge of the flow restricting member is located in use in contact or close proximity with the conveyor belt thereby to prevent backflow of material in the downstream-to-upstream direction.

The flow restricting member may be slidably moveble over the flow through opening, preferably by at least one primary threaded position adjusting rod extending between the flow restricting member and the upper container portion, the primary threaded position adjusting rod being co-operative with a primary threaded position adjusting female body to translate a rotary motion imparted on the primary threaded position adjusting rod or body into an up and down movement of the flow restricting member.

Generally, the at least one primary threaded position adjusting rod is anchored on the flow restricting member or the upper container portion and the primary threaded position adjusting female body is anchored on or part of the other of the flow restricting member or the upper container portion, the at least one primary threaded position adjusting rod being a bolt. Typically, the primary threaded position adjusting female body is a nut.

Alternatively, the flow restricting member may be hingedly or pivotally moveble over the flow through opening, the feeder further comprising an abutment member for abutting the flow restricting member and limiting the lowest position thereof so as in use to locate the operatively lower edge of the flow restricting member in close proximity or light contact with the conveyor belt.

In yet another alternative embodiment, the flow restricting member is the rear end wall of the lower container portion being fixed between the opposing side walls and having an operatively lower terminal edge extending passed the lower terminal edges of the opposing side walls of the lower container portion and terminating in use in contact or close proximity with the conveyor belt thereby to prevent backflow of material in the downstream-to-upstream direction.

In even a further alternative embodiment, the flow restricting member is angled having an upper edge integral, in contact or located in close proximately with the rear end wall of the upper container portion and the operatively lower terminal edge thereof positioned operatively forwardly of the front end wall of the upper container portion so as in use to cause the material falling under the force of gravity through the container to move from the rear end wall toward the front end wall during discharge and to deflect the weight of the material discharging in use from the container so not to act directly on the conveyor belt. Preferably, the operatively lower terminal edge of the flow restricting member is spaced beneath and proximately aligned with the front end wall of the upper container portion. Most preferably, the operatively lower terminal edge of the flow restricting member extends operatively forwardly of the front end wall of the upper container portion.

Preferably, the front end wall of the lower container portion defines a discharge opening over which the flow regulating member is moveble between an open position, wherein an operatively lower terminal edge of the flow regulating member is raised in use into a spaced relationship with the conveyor belt so as to allow discharge of material from the container onto the conveyor belt there through, and a closed position wherein the operatively lower terminal edge of the flow regulating member is located in use in contact or close proximity with the conveyor belt, or a portion of the flow restricting member positioned in use between the operatively lower terminal edge of the flow regulating member and the conveyor belt, so as in use to shut off discharge of material from the container.

The flow regulating member may be slidably, pivotally or hingedly movable over the discharge opening. Preferably, the flow regulating member is slidably moveble by at least one secondary threaded position adjusting rod extending between the flow regulating member and the upper container portion, the secondary threaded position adjusting rod being co-operative with a secondary threaded position adjusting female body to translate a rotary motion imparted on the secondary threaded position adjusting rod or body into an up and down movement of the flow regulating member.

Typically, the at least one secondary threaded position adjusting rod is anchored on the flow regulating member or the upper container portion and the secondary threaded

position adjusting female body is anchored on or part of the other of the flow regulating member or the upper container portion, the at least one secondary threaded position adjusting rod being a bolt. Generally, the secondary threaded position adjusting female body is a nut.

Generally, at least a portion of the terminal edges of the opposing side walls are in use substantially parallel with the direction of travel of the conveyor belt and in use guide material discharged onto the conveyor belt away from riding over the side of the conveyor belt and spilling between the conveyor belt and an inner side of the pipe.

Furthermore, the feeder may include guide formations extending operatively forwardly from the lower container portion and beyond the front end wall thereof, the guide formations being spaced apart from one another by a width substantially the same or smaller than the width of the conveyor belt so as to provide in use a further guide for guiding the material discharged onto the conveyor belt away from riding over the sides of the conveyor belt. Preferably, the guide formations extend parallel with, co-planar with and/or are integral with the respective opposing side wall of the lower container portion.

Any one or more of the opposing side walls, the guide formations and the flow restricting member may comprise a contact member fixed at one end to or over the operatively lower terminal edge of the respective one or more of the opposing side walls, guide formations and/or flow restricting member and having a free end adapted in use to ride at least partially on the moving conveyor belt, forming a seal there between.

Preferably, the contact members are in use flexibly movable between a raised position, wherein the material travelling on the conveyor belt in the upstream-to-downstream direction lifts the contact members from the conveyor belt so as to pass there beneath, and a lowered position, wherein the contact members return into contact with the conveyor belt under the force of gravity and/or the weight of the material acting thereon, thereby providing a barrier to flow of material in the downstream-to-upstream direction, particularly where the conveyor belt is an inclined conveyor belt and not moving.

More preferably, the contact members are integral with the respective opposing side walls, guide formations and/or flow restricting member. Even more preferably, the contact members are made from a plastic-like or rubber-like material being softer than the material from which the conveyor belt is made so as to minimise damage of the conveyor belt caused in use by contact between the contact members and the conveyor belt. Furthermore, the contact members may be capable of taking a concave-like or a trough-like shape between the respective opposing side walls, guide formations and/or flow restricting member and the conveyor belt.

The flow regulating member may also comprise a contact member. Typically, the operatively lower terminal edge of flow regulating member and/or the contact member thereon are straight or U-shaped to correspond to the shape of the conveyor belt or that portion of the flow restricting member against which the flow regulating member is abuttable in the closed position.

It will be appreciate that in one or more of the preferred embodiments, the flow restricting member acts also as a scrapper. Furthermore, the feeder may include at least one lockable inspection cap covering an inspection aperture defined in the mounting formation.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a perspective view of a first embodiment of a feeder for a pipe conveyor in accordance with the present invention;

Figure 2 shows a side view of the feeder of figure 1 installed on a pipe conveyor;

Figure 3 shows a front view of the feeder of figure 2;

Figure 4 shows a side view of a second embodiment of a feeder for a pipe conveyor in accordance with the present invention;

Figure 5 shows a side view of a third embodiment of a feeder for a pipe conveyor in accordance with the present invention; and

Figure 6 shows an enlarged schematic side view of the first embodiment of the feeder of figure 1 in use.

DETAILED DESCRIPTION OF THE DRAWINGS

A feeder for a pipe conveyor according to a preferred embodiment of the invention is designated generally with the reference numeral 10 in figure 1. The feeder 10 includes a container 12, a flow regulating member 14 and a flow restricting member 16.

The container 12 is formed from a front end wall 18, an opposing rear end wall 20 and opposing side walls 22,24 extending between the front end wall 18 and the rear end wall 20 to jointly define loading and discharge ends 26,28 of the container 12 respectively.

With reference now also to figure 2 and figure 3, showing the feeder 10 mounted within an aperture on a pipe 90, the container 12 is divided by mounting formations 30,32 into an upper container portion 12A and a lower container portion 12B, the lower container portion 12B being supported in use within the pipe 90 by the mounting formations 30,32 so as to be concealed from view. Although the mounting formations 30,32 are illustrated as mounting plates extending from each of the opposing side walls 22,24, it will be appreciated that the mounting formations 30,32 may extend alternatively from the other walls 18,20 of the container 12 or from all the walls 18,20,22,24 of the container 12.

The mounting formations 30,32 have means 34 for adjusting the height of the feeder 10 relative to the pipe 90. Although the height adjusting means 34 may take many different forms, the height adjusting means is a height adjusting threaded rod in the form of a

bolt 34 being co-operative with height adjusting female formations (not shown) on the mounting formations 30,32 and/or on corresponding mounting formations 92,94 on the pipe 90. The height adjusting female formations may be threaded apertures (not shown) on both or either of the mounting formations 30,32 on the feeder 10 or the corresponding mounting formations 92,94 on the pipe 90, or nuts positioned in alignment with unthreaded apertures in the aforementioned mounting formations 30,32,92,94.

It will be appreciated that through co-operation between the height adjusting bolt 34 and the height adjusting female formations, a rotary motion imparted on the height adjusting bolt 34 (or on the height adjusting female formations where the height adjusting female formations are in the form of nuts) is translated into an up and down movement of the feeder 10 relative to the pipe 90. This enables the position of the entire feeder 10 to be adjusted relative to the conveyor belt 100.

Once the required height of the feeder 10 relative to the pipe 90 and to the conveyor belt 100 running therein has been attained, the position of the feeder 10 can be locked by one or more threaded locking rods 36, in the form of locking bolts, being co-operative with corresponding threaded locking female formations, in the form of locking nuts 38 or some threaded aperture defined in the mounting formations 30,32,92,94.

The feeder 10 may be fastened directly to a feed source 96, generally in the form of a hopper, a bin or feed ducting or piping. Typically, the feed source 96 is part of a fixed installation having a discharge end 98 that cannot be moved. To provide the necessary clearance height between the discharge end 98 of the feed source 96 and the top of the pipe 90, for the purposes of lifting clear the lower container portion 12B of the container 12 from the pipe 90, a spacer member 40 is insertable between the loading end 26 of the feeder 10 and the discharge end 98 of the feed source 96.

The spacer member 40 comprises a loading end 42 and a discharge end 44 securable between the feeder 10 and the feed source 96 by fasteners passing through correspondingly aligned apertures 46 in flanges 48 located on each of the feeder 10, the spacer member 40 and the feed source 96. Instead of securing the feeder 10, the spacer member 40 and the feed source 96 to one another by way of fasteners and

flanges, it will be appreciated that the spacer member 40 may have a loading end 42 sized to receive the discharge end 98 of the feed source 96 therein, tapering down to a discharge end 44 receivable within the loading end 26 of the container 12.

To shut off the flow of a material from the feed source 96 to the feeder 10, for the purposes of removing, replacing or maintaining the feeder 10, a secondary flow regulating member, in the form of a knife valve 50, is securable between the feeder 10 and the feed source 96, preferably directly between the loading end 42 of the spacer member 40 and the discharge end 98 of the feed source 96. The knife valve 50 is securable in position by correspondingly flanges 48 and includes a control gate 52 being movable between open and closed positions across a mouth 54 of the knife valve 50 by an actuator 56, in the form of a co-operating threaded rod and threaded nut combination.

The flow restricting member 16 in use restricts the flow of material deposited on the conveyor belt 100 in an upstream-to-downstream direction T (i.e. the direction in which the conveyor belt travels), thereby preventing rollback or backflow of the material in an opposite downstream-to-upstream direction passed the feeder 10, particularly in applications where the pipe conveyor 90 is inclined upwardly in the upstream-to-downstream direction T.

The flow restricting member 16 is a plate, angled relative to the rear end wall 20 at an upper edge 16A. The flow restricting member 16 runs operatively downwardly and forwardly from the upper edge 16A toward a free end having a lower edge 16B extending operatively forwardly past the front end wall 18, in use to be positioned in contact or close proximity with the conveyor belt 100.

The flow restricting member 16 is fixed to the opposing side wall 22,24. The upper edge 16A of the flow restricting member 16 may also be fixed to the rear end wall 20. Alternatively, the flow restricting member 16 is that portion of the rear end wall 20 concealed by the pipe and bent at the upper edge 16A thereof to the required angle.

In yet another alternative embodiment, the flow restricting member 16 may be hinged at the upper edge 16A relative to the rear wall 20 and unfixed to the opposing side

walls 22,24. In this alternative embodiment, the feeder 10 may comprise a restricting member to restrict the lowest point of the lower edge 16B of the flow restricting member 16 to a position in close proximity with the conveyor belt 100 or to a position enabling light contact between the lower edge 16B and the conveyor belt 100.

It will be appreciated that the function of the flow restricting member 16 is to direct the material falling through the feeder 10 under the force of gravity to move operatively downwardly and forwardly toward the discharge end 28 of the container 12 and to deflect the weight of the material discharging in use from the container 12 so as not to act directly on the conveyor belt 100. Deflection of the weight in this manner prevents the conveyor belt 100 from bogging down under the weight of the material and/or reduces the amount of power required by the drive means to drive the conveyor belt 100.

The front end wall 18 defines a discharge opening 58 over which the flow regulating member 14 is slidably moveble between an open position and a closed position. In the open position, an operatively lower terminal edge 14A of the flow regulating member 14 is raised into a spaced relationship with the conveyor belt 100 so as in use to allow discharge of material from the container 12 onto the conveyor belt 100 there through.

In the closed position, the operatively lower terminal edge 14A of the flow regulating member 14 abuts the conveyor belt 100, the lower edge 16B of the flow restricting member 16 or a portion of the flow restricting member 16 proximate the lower edge 16B thereof so as in use to create a seal to the flow of material from the container 12 thereby shutting off material discharge from the container 12.

Although the flow regulating member 14 has been illustrated as a sliding gate, it will be appreciated that the flow regulating member 14 may be moved between the open and closed position in any other way, for example, by some form of pivoting or hinged action.

The position of the flow regulating member 14 between the open and closed positions may be adjusted in many different ways. In the illustrated embodiment, the position is adjusted by an adjustment rod in the form of a bolt 60 being co-operative with an

adjustment female formation 62, either of which being anchored on the flow regulating member 14. The adjustment bolt 60 and the adjustment female formation 62, typically in the form of nut, co-operate to translate a rotary motion imparted on one or both of the adjustment bolt 60 and/or the adjustment female formation 62 into an up and down movement of the flow regulating member 14.

In use, the terminal edges 22A,24A of the opposing side walls 22,24 are substantially parallel with the direction of travel T of the conveyor belt and act to guide material discharged onto the conveyor belt 100, by the respective feeder 10 or a preceding feeder (not shown) upstream of the respective feeder 10 on the pipe 90, away from riding over the sides 102 of the conveyor belt 100 and spilling between the conveyor belt 100 and an inner side of the pipe 90.

Guide formations 64 extend operatively forwardly from the lower container portion 12B (i.e. in the direction of travel T of the conveyor belt 100) and beyond the front end wall 18 of the container 12. The guide formations 64 are spaced apart from one another by a width substantially the same or smaller than the width of the conveyor belt 100 so as to provide in use a further guide for guiding the material on the conveyor belt 100 away from riding over the sides 102 of the conveyor belt 100. It will be appreciated that the guide formations 64 may extend parallel with, co-planar with and/or be integral with the respective side walls 22,24 of the lower container portion 12B.

The guide formations 64 and the flow restricting member 16 comprise contact members 64 extending downwardly beyond their operatively lower terminal edges to in use contact the conveyor belt 100. The contact members 64 may be the integral with the respective guide formations 64 and flow restricting member 16. Typically, the contact members are flexible rubber- or plastic like members fixed at one end to the respective guide formations 64 and flow restricting member 16 and free at the opposite end to in use ride, or at least partly ride, on the conveyor belt 100. It will be appreciated that the contact members 66 may also extend long the side walls 22,24 of the container 12.

The contact members 66 bridge any gaps between the respective guide formations 64, flow restricting member 16 and/or side walls 22,24 of the container 12 with the

conveyor belt 100, thereby forming a seal there between to prevent the backflow or roll back of material in the downstream-to-upstream direction, particularly where the conveyor belt 100 is not moving and inclined upwardly in the upstream-to-downstream direction T.

With reference now also to figure 6, and with the conveyor belt 100 operating (i.e. moving in the direction T), material travelling on the conveyor belt 100 from an upstream source relative to position of the feeder 10 on the pipe 90 pushes the contact members 66 upwards into a raised position, thereby to enable the material to pass under the feeder 10. The contact members 66 are returnable to a lowered position, i.e. into contact with the conveyor belt 100, under the force of gravity and/or the weight of the material falling or rolling back thereon.

With the contact members 66 being capable of moving upwards and downwards as described, multiple feeders 10 are positionable along a pipe conveyor 90 enabling multiple materials to be introduced to the conveyor belt 100 without the risk of the materials mixing prematurely and/or excessively should the conveyor belt 100 cease to run, particularly in inclined applications. This capability is specifically useful in producing aggregate, for example a settable concrete, where sand can be introduced to the conveyor belt by a send feeder, stone by a further upstream stone feeder, cement by an even further upstream cement feeder and water by the furthest upstream feeder.

It will be appreciated that to prevent unnecessary wear or damage to the conveyor belt 100, that the contact members 66 are manufactured from a material being softer than the conveyor belt 100. In this way, the contact members 66, and not the conveyor belt 100, will wear. It has been found that a material known in the trade as LINOTEX rubber is a suitable material for making the contact members 66. The contact members 66, as a result of riding on or partly on the conveyor belt 100, take a concave- or trough-like shape.

It will be further appreciated that the flow regulating member 14 also comprises of some sort of contact member (not shown) to better the seal between it and the conveyor belt 100 or flow restricting member 16 in the closed position. Typically, the

operatively lower terminal edge 14A of the flow regulating member 14, or the contact member thereon, is straight or U-shaped to correspond to the shape of conveyor belt 100 or the flow restricting member 16 at the location at which the abutment takes place.

Referring now to figure 4, illustrating an alternative embodiment and where like reference numerals refer to like components, a feeder 210 comprises a container 212, a flow regulating member 214 slidably movable with respect to the container 212 to discharge material onto the conveyor belt 100 and a flow restricting member 216 in the form of a fixed rear end wall 220. In this embodiment material being discharged onto the conveyor belt 100 by the feeder 210 is prevented from flowing or rolling back passed the flow restricting member 216 due to the contact or close proximity of the lower edge 216B of the flow restricting member 216 with the conveyor belt 100. A feeder 210 of this embodiment is particularly suited to being the furthest upstream feeder in an inclined pipe conveyor installation.

Referring now to figure 5, illustrating yet another embodiment of the feeder 310, the flow restricting member 316 may be in the form of a sliding gate slidable relative to the rear end wall 320 of the upper container portion 312A. The feeder 310 of this embodiment, with the flow restricting member 316 positioned in a lowered position thereby to prevent backflow of material in the downstream-to-upstream direction, is particularly suited to being the furthest upstream feeder in an inclined pipe conveyor installation.

By raising the flow restricting member 316 into a raised position, material flowing in the upstream-to-downstream direction is allow flow beneath the relative feeder, enabling the same feeder 310 to act as any other intermediate feeder along the inclined pipe conveyor installation. The dual configuration of the feeder 310 is advantageous from a manufacturing point of view, enabling manufacture of a single type of feeder 310 that can be configured for use in more than one application.

It will be appreciated that in either of the embodiments illustrated in figure 4 or figure 5, the flow restricting member 216,316 is capable of also acting as a scrapper for scrapping material residue off the conveyor belt 100.

Although the invention has been described above with reference to preferred embodiments and examples, it will be appreciated that many modifications or variations of the invention are possible without departing from the spirit or scope of the invention. For example, the feeder may comprise an inspection opening positioned forwardly of the front end wall and/or rearward of the rear end wall 20, which inspection opening can closed by inspection caps that are lockable for security purposes. In another example, the manual height adjusting means may be automatic and in the form of hydraulically, pneumatically or electrically actuated height adjusting members extending between the mounting formations on the container of the feeder and the pipe. It will be appreciated that where the height adjusting means is automatic, it may be operated locally or remotely.

CLAIMS

1. A feeder for feeding material onto a conveyor belt enclosed in a pipe and travelling in an upstream-to-downstream direction, the feeder including:

a container having a loading end for receiving the material and a discharge end for discharging the material onto the conveyor belt;

a flow regulating member for regulating the flow of material through the discharge end of the container, the flow regulating member being movable relative to the container; and

a flow restricting member for in use restricting the flow of material deposited on the conveyor belt to the upstream-to-downstream direction thereby preventing the backflow of material in an opposite downstream-to-upstream direction, the flow restricting member having a free end positionable in use in contact or close proximity with the conveyor belt.

2. A feeder according to claim 1, further including a spacer member positionable in use between the loading end of the container and a discharge end of a feed source, the spacer member having a height to provide, when removed from the container, sufficient space between the container and the feed source for the feeder to be lifted and removed from the pipe for general maintenance, repair and/or replacement.

3. A feeder according to claim 2, wherein the loading end of the container defines a mouth into which a discharge end of the spacer member is receivable, or to which the discharge end of the spacer member is releasably attachable by correspondingly engageable flanges on the loading end of the container and the discharge end of the spacer member.

4. A feeder according to claim 3, wherein a loading end of the spacer member defines a mouth into which a discharge end of the feed source is receivable, or to which the discharge end of the feed source is releasably attachable by

correspondingly engageable flanges on the loading end of the spacer member and the discharge end of the feed source.

5. A feeder according to claim 4, wherein the feeder includes a secondary flow regulating member for regulating the flow of material from the feed source to the container, the secondary flow regulating member being locatable on the discharge end of the feed source and in use operatively above the spacer member enabling, with the secondary flow regulating member in a closed position thereby shutting off flow from the feed source, removal of the spacer member.

6. A feeder according to claim 5, wherein the secondary flow regulating member is a knife valve.

7. A feeder according to claim 6, wherein the feed source is from a group of feed sources including hoppers, bins, feed ducting or feed piping.

8. A feeder according to claim 7, wherein the feeder comprises mounting plates extending from one or more sides of the container, the mounting plates being co-operative with a mounting cradle on which the feeder is mountable so as enable the feeder to be fitted in use over an exposed portion of the conveyor belt between a drive or idler pulley of the pipe conveyor and the respective end of the pipe conveyor.

9. A feeder according to claim 8, wherein the feeder and the mounting cradle, independently or jointly, include a means for adjusting the height of the feeder relative to the conveyor belt.

10. A feeder according to claim 7, wherein the container includes mounting formations for mounting the feeder over a feeder receiving opening defined in the pipe in which the conveyor belt is enclosed.

11. A feeder according to claim 10, wherein the mounting formations comprises mating plates extending from one or more sides of the container, the mounting plates

being correspondingly contoured to corresponding mounting plates fixed to the pipe or to an outside surface of the pipe directly.

12. A feeder according to claim 9 or claim 11, wherein the mounting formations include a means for adjusting the height of the feeder relative to the pipe and/or the conveyor belt.

13. A feeder according to claim 12, wherein the height adjusting means is automatic and in the form of hydraulically, pneumatically or electrically actuated height adjusting members extending between the mounting formations on the container of the feeder and the pipe.

14. A feeder according to claim 12, wherein the height adjusting means is manual and in the form of a plurality of threaded height adjusting rods extending between the mounting formations on the container of the feeder and the pipe, the threaded height adjusting rods being co-operative with a threaded height adjusting female formation on the mounting formations on the feeder and/or on the corresponding mounting plates on the pipe to translate a rotary motion imparted on the threaded height adjusting rods and/or the threaded height adjusting female formation into an up and down movement of the feeder relative to the pipe, the feeder being releasably lockable at the required height by one or more threaded locking rods being co-operative with corresponding threaded locking female formations.

15. A feeder according to claim 14, wherein the threaded height adjusting rods and the threaded locking rods are bolts, and the threaded adjusting female formation and threaded locking female formations are nuts or threaded apertures on the mounting formations of the feeder and/or on the corresponding mounting formations on the pipe.

16. A feeder according to claim 15, wherein the container comprises:

a front end wall;

an opposing rear end wall; and

opposing side walls extending between the front and rear end walls, the mounting formations being fixed to one or more of the end and/or side walls at a location between the loading and the discharge ends of the container so as to divide the container mounted in use to the pipe into an upper container portion, being that portion of the container extending operatively above the pipe, and a lower container portion, being that portion of the container extending into and concealed from view by the pipe, such that in use operatively lower terminal edges of the opposing side walls of the lower container portion are located in contact or close proximity with the conveyor belt.

17. A feeder according to claim 16, wherein the rear end wall of the lower container portion defines a flow through opening over which the flow restricting member is moveble between a non-restricting open position, wherein an operatively lower terminal edge of the flow restricting member is in use raised into a spaced relationship with the conveyor belt so as to allow material travelling on the conveyor belt to pass beneath the feeder, and a restricting closed position, wherein the operatively lower terminal edge of the flow restricting member is in use located in contact or close proximity with the conveyor belt thereby to prevent backflow of material in the downstream-to-upstream direction.

18. A feeder according to claim 17, wherein the flow restricting member is slidably moveble over the flow through opening.

19. A feeder according to claim 18, wherein the flow restricting member is slidably moveble by at least one primary threaded position adjusting rod extending between the flow restricting member and the upper container portion, the primary threaded position adjusting rod being co-operative with a primary threaded position adjusting female body to translate a rotary motion imparted on the primary threaded position adjusting rod or body into an up and down movement of the flow restricting member.

20. A feeder according to claim 19, wherein the at least one primary threaded position adjusting rod is anchored on the flow restricting member or the upper container

portion and the primary threaded position adjusting female body is anchored on or part of the other of the flow restricting member or the upper container portion, the at least one primary threaded position adjusting rod being a bolt and the primary threaded position adjusting female body being a nut.

21. A feeder according to claim 20, wherein the at least one primary threaded position adjusting rod is a bolt and the primary threaded position adjusting female body is a nut.

22. A feeder according to claim 21, wherein the flow restricting member is hingedly or pivotally moveble over the flow through opening, the feeder further comprising an abutment member for abutting the flow restricting member and limiting the lowest position thereof so as in use to locate the operatively lower edge of the flow restricting member in close proximity or light contact with the conveyor belt.

23. A feeder according to claim 16, wherein the flow restricting member is the rear end wall of the lower container portion being fixed between the opposing side walls and having an operatively lower terminal edge extending passed the lower terminal edges of the opposing side walls of the lower container portion and terminating in use in contact or close proximity with the conveyor belt thereby to prevent backflow of material in the downstream-to-upstream direction.

24. A feeder according to claim 23, wherein the flow restricting member is angled having an upper edge integral, in contact or located in close proximately with the rear end wall of the upper container portion and the operatively lower terminal edge thereof positioned operatively forwardly of the front end wall of the upper container portion so as in use to cause the material falling under the force of gravity through the container to move from the rear end wall toward the front end wall during discharge and to deflect the weight of the material discharging in use from the container so not to act directly on the conveyor belt.

25. A feeder according to claim 24, wherein the operatively lower terminal edge of the flow restricting member is spaced beneath and proximately aligned with the front end wall of the upper container portion.

26. A feeder according to claim 25, wherein the operatively lower terminal edge of the flow restricting member extends operatively forwardly of the front end wall of the upper container portion.

27. A feeder according to any one of claims 17 to 26, wherein the front end wall of the lower container portion defines a discharge opening over which the flow regulating member is moveble between an open position, wherein an operatively lower terminal edge of the flow regulating member is raised in use into a spaced relationship with the conveyor belt so as to allow discharge of material from the container onto the conveyor belt there through, and a closed position wherein the operatively lower terminal edge of the flow regulating member is located in use in contact or close proximity with the conveyor belt, or a portion of the flow restricting member positioned in use between the operatively lower terminal edge of the flow regulating member and the conveyor belt, so as in use to shut off discharge of material from the container.

28. A feeder according to claim 27, wherein the flow regulating member is slidably, pivotally or hingedly movable over the discharge opening.

29. A feeder according to claim 28, wherein the flow regulating member is slidably moveble by at least one secondary threaded position adjusting rod extending between the flow regulating member and the upper container portion, the secondary threaded position adjusting rod being co-operative with a secondary threaded position adjusting female body to translate a rotary motion imparted on the secondary threaded position adjusting rod or body into an up and down movement of the flow regulating member.

30. A feeder according to claim 29, wherein the at least one secondary threaded position adjusting rod is anchored on the flow regulating member or the upper container portion and the secondary threaded position adjusting female body is anchored on or part of the other of the flow regulating member or the upper container portion, the at least one secondary threaded position adjusting rod being a bolt and the secondary threaded position adjusting female body being a nut.

31. A feeder according to claim 29, wherein the at least one secondary threaded position adjusting rod is a bolt and the secondary threaded position adjusting female body is a nut

32. A feeder according to claim 31, wherein at least a portion of the terminal edges of the opposing side walls are in use substantially parallel with the direction of travel of the conveyor belt and in use guide material discharged onto the conveyor belt away from riding over the side of the conveyor belt and spilling between the conveyor belt and an inner side of the pipe.

33. A feeder according to claim 32, wherein guide formations extend operatively forwardly from the lower container portion and beyond the front end wall thereof, the guide formations being spaced apart from one another by a width substantially the same or smaller than the width of the conveyor belt so as to provide in use a further guide for guiding the material discharged onto the conveyor belt away from riding over the sides of the conveyor belt.

34. A feeder according to claim 33, wherein the guide formations extend parallel with, co-planar with and/or are integral with the respective opposing side wall of the lower container portion.

35. A feeder according to claim 34, wherein any one or more of the opposing side walls, the guide formations and the flow restricting member comprise a contact member fixed at one end to or over the operatively lower terminal edge of the respective one or more of the opposing side walls, guide formations and/or flow restricting member and having a free end adapted in use to ride at least partially on the moving conveyor belt, forming a seal there between.

36. A feeder according to claim 36, wherein the contact members are in use flexibly movable between a raised position, wherein the material travelling on the conveyor belt in the upstream-to-downstream direction lifts the contact members from the conveyor belt so as to pass there beneath, and a lowered position, wherein the contact members return into contact with the conveyor belt under the force of

gravity and/or the weight of the material acting thereon, thereby providing a barrier to flow of material in the downstream-to-upstream direction.

37. A feeder according to claim 36, wherein the contact members are integral with the respective opposing side walls, guide formations and/or flow restricting member.

38. A feeder according to claim 37, wherein the contact members are made from a plastic-like or rubber-like material being softer than the material from which the conveyor belt is made so as to minimise damage of the conveyor belt caused in use by contact between the contact members and the conveyor belt, the contact members capable of taking a concave-like or a trough-like shape between the respective opposing side walls, guide formations and/or flow restricting member and the conveyor belt.

39. A feeder according to claim 38, wherein the flow regulating member comprises a contact member.

40. A feeder according to claim 39, wherein the operatively lower terminal edge of flow regulating member and/or the contact member thereon are straight or U-shaped to correspond to the shape of the conveyor belt or that portion of the flow restricting member against which the flow regulating member is abuttable in the closed position.

41. A feeder according to claim 40, wherein the flow restricting member acts also as a scrapper.

42. A feeder according to claim 41, wherein the conveyor belt and the pipe enclosing the conveyor belt are inclined.

43. A feeder according to claim 42, including at least one lockable inspection cap covering an inspection aperture defined in the mounting formation.

44. A feeder substantially as herein described and illustrated.

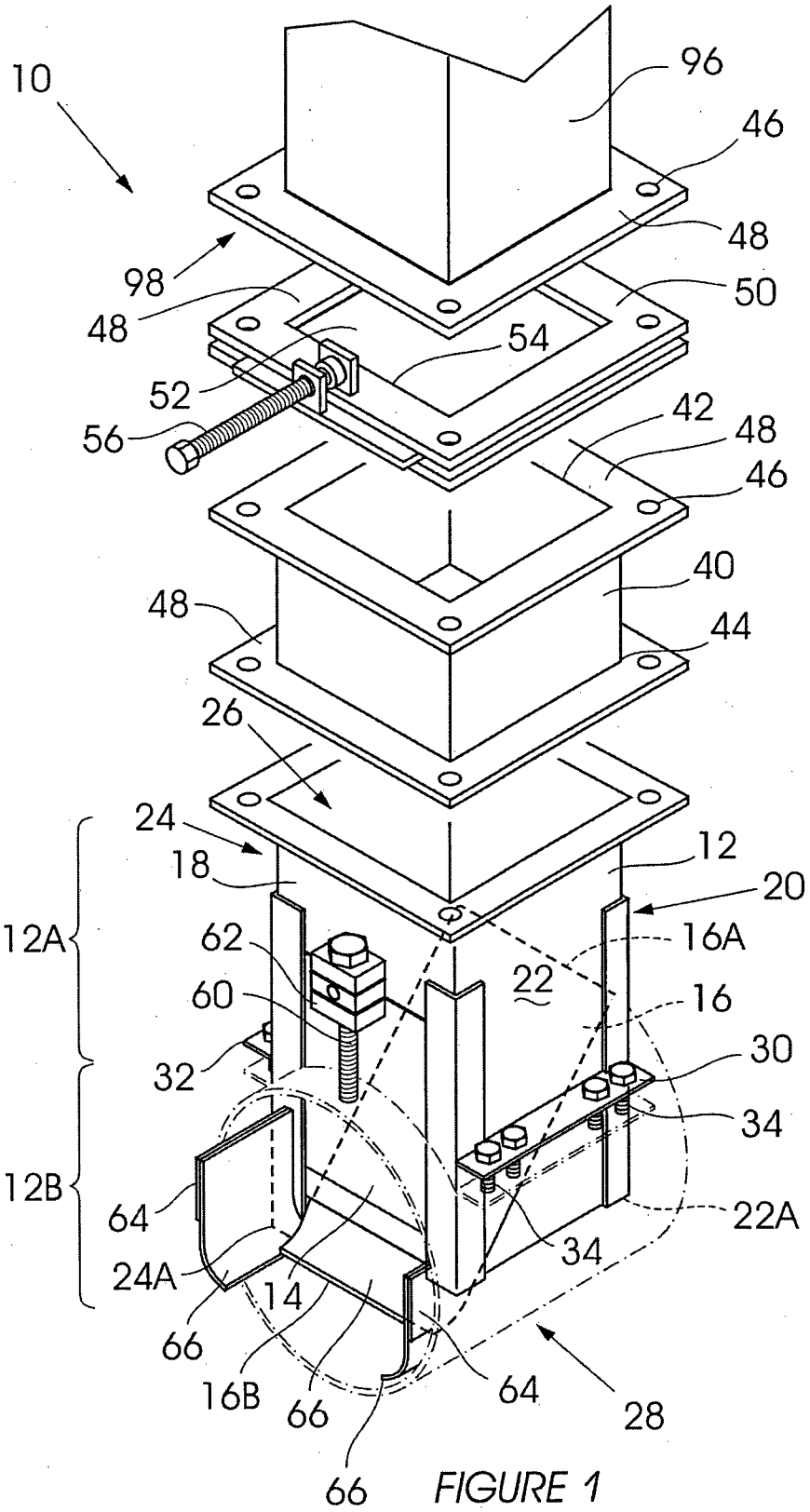
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FIGURE 1

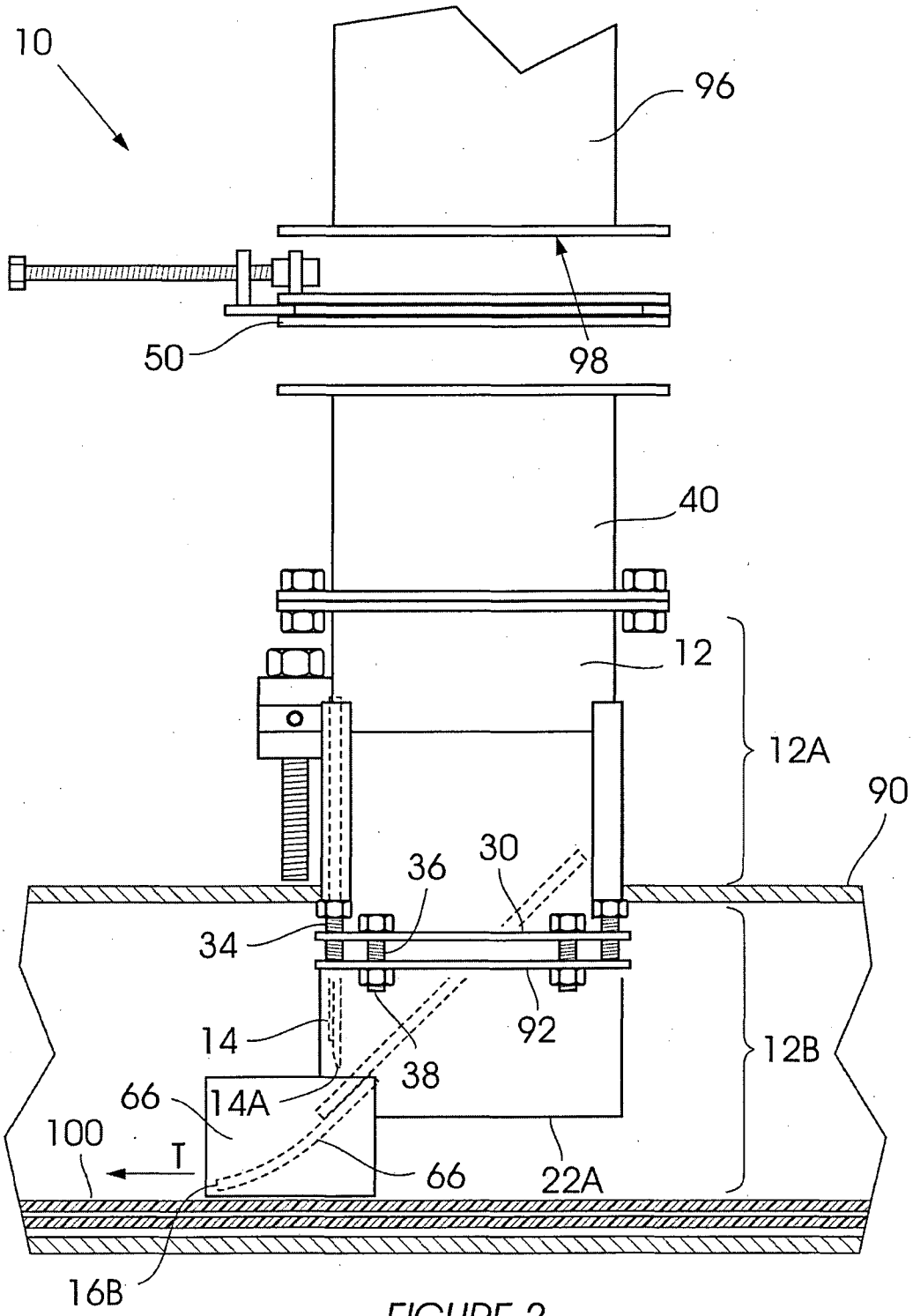

FIGURE 2

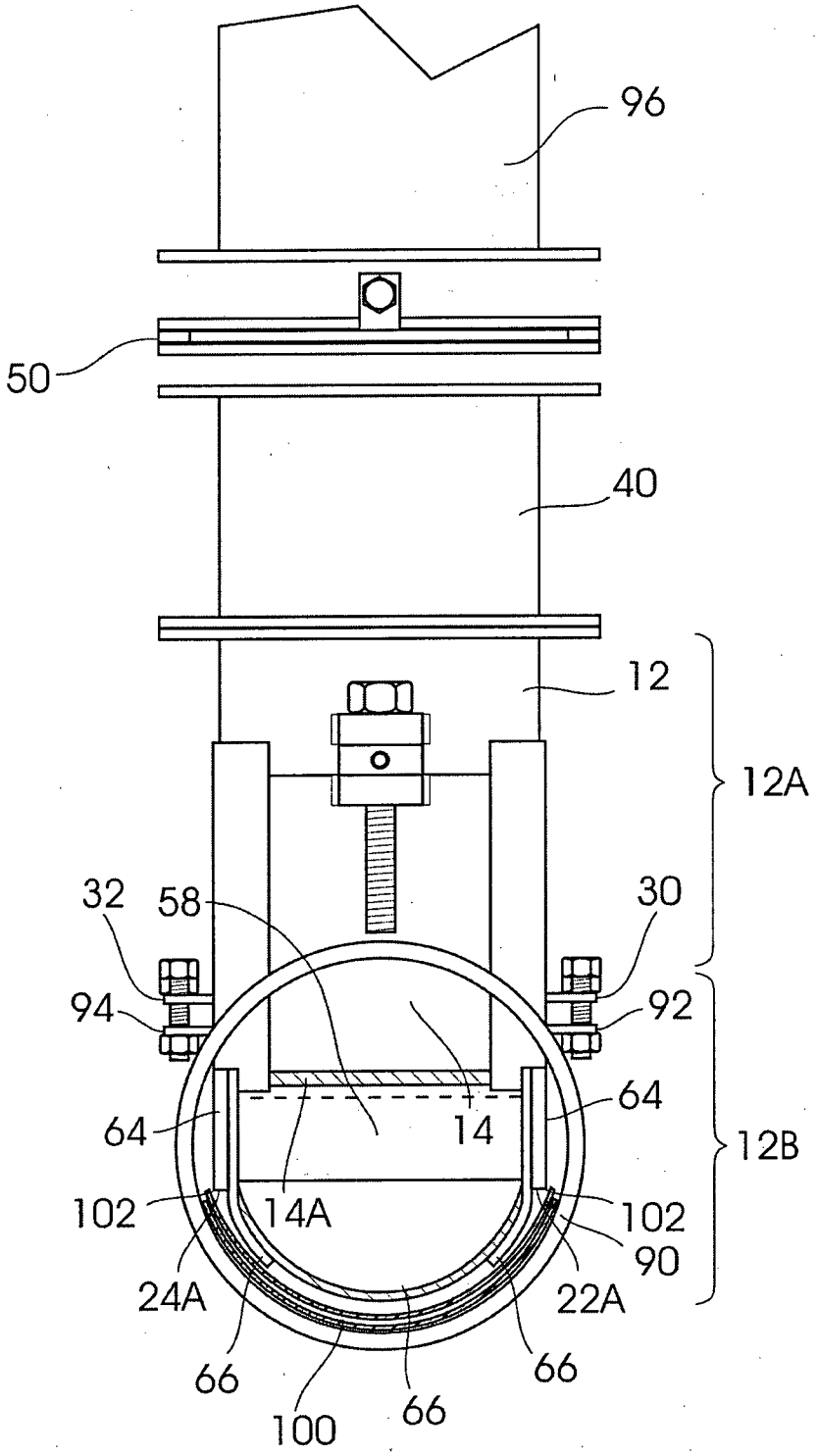
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FIGURE 3

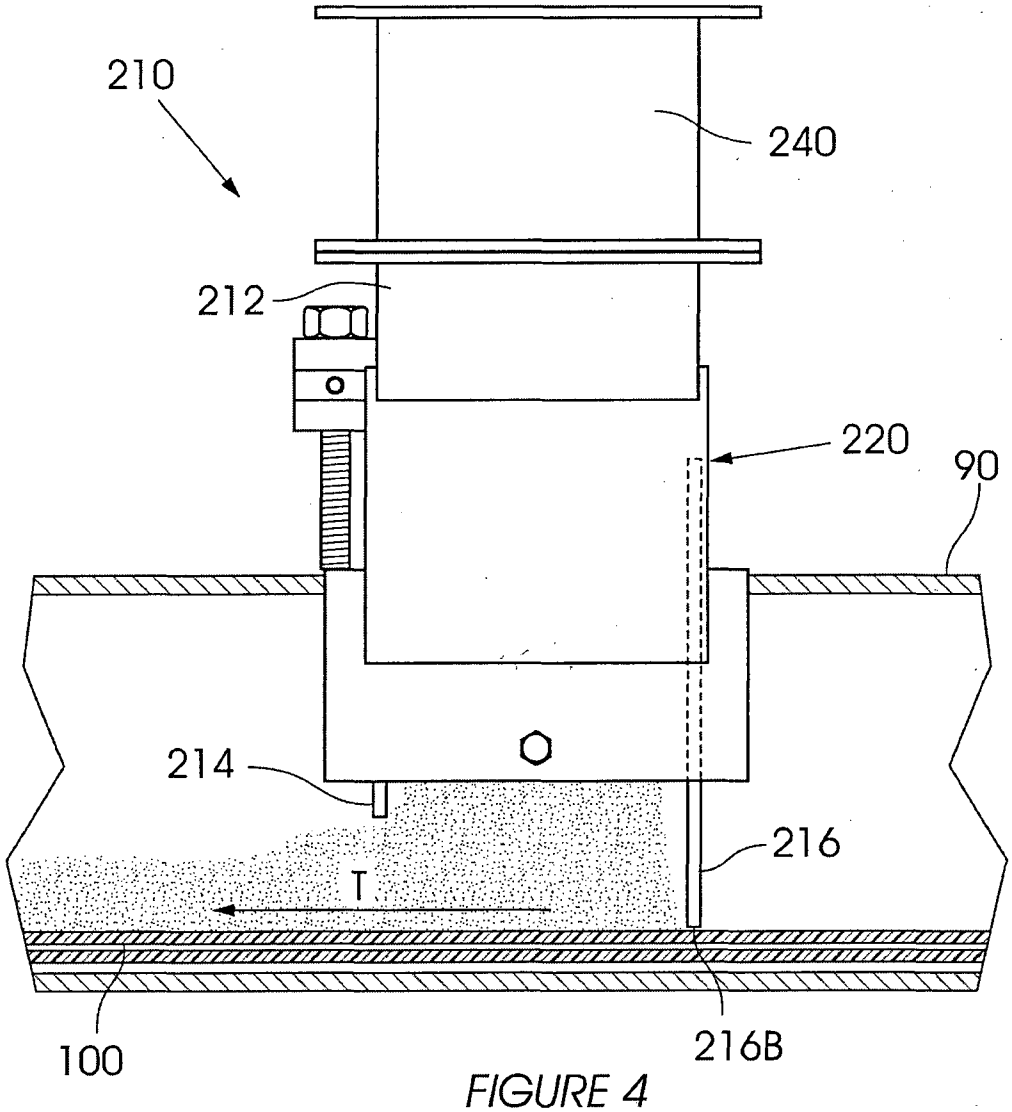

FIGURE 4

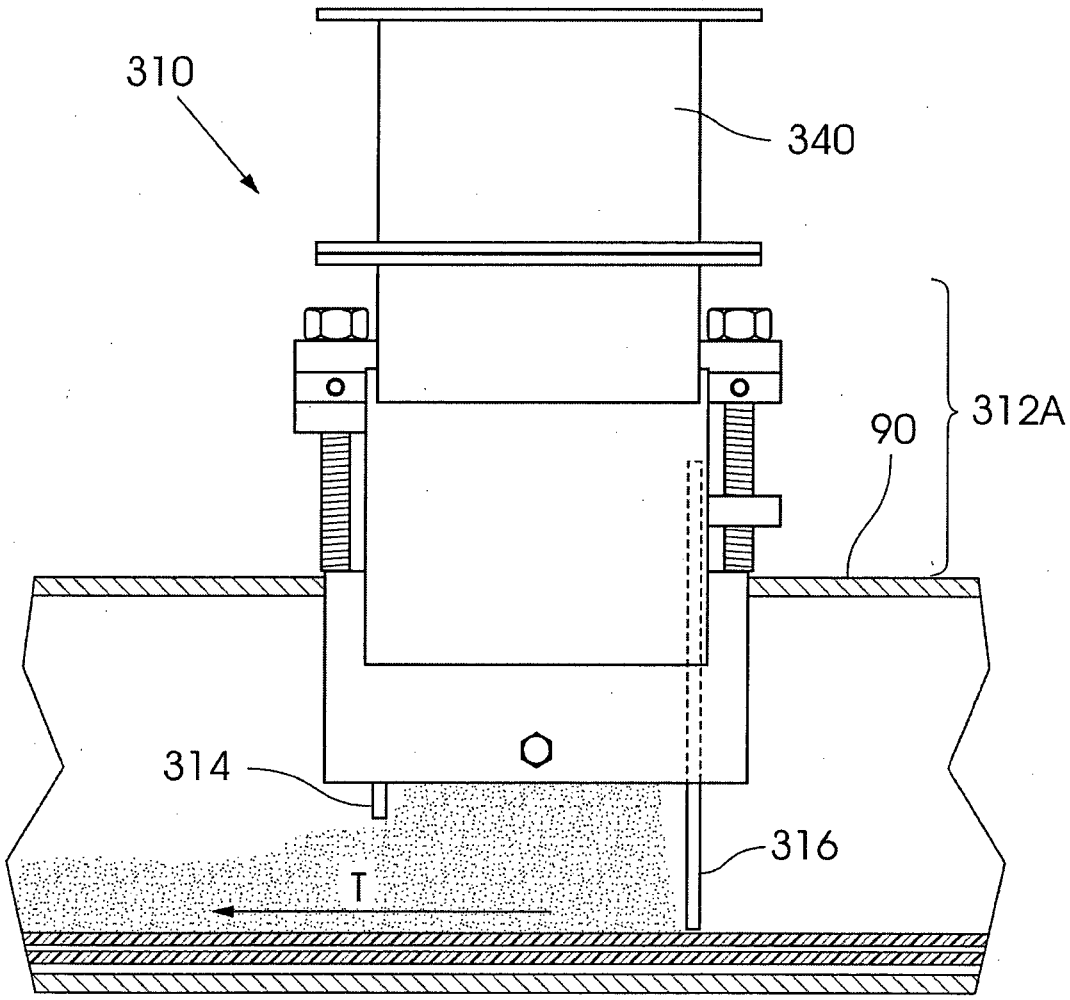

FIGURE 5

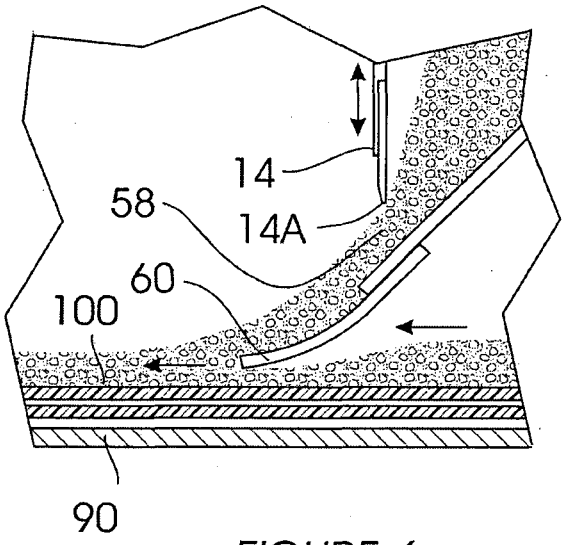

FIGURE 6