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(54) Balanced vent

(57) A vent comprises a duct (16) defining a vent passageway having a vent passageway exit and a vent cover (24) movable between a first aperture position and a second aperture position in which the vent passageway exit is fully covered and is not fully covered, respectively. There is an aperture (140) in a duct side wall which is closed when the vent covers (24) is in the first operative position and open to allow air to pass to or from the vent passageway through the aperture when the vent cover (24) is in a third operative position in which the vent passageway exit is also fully covered. The vent cover (24) may be a second vent cover, which are interlinked so as to be constrained to move together, either towards each other to cover the vent passageway exit or away from each other to uncover the vent passageway exit. In this latter embodiment the operative is optional.

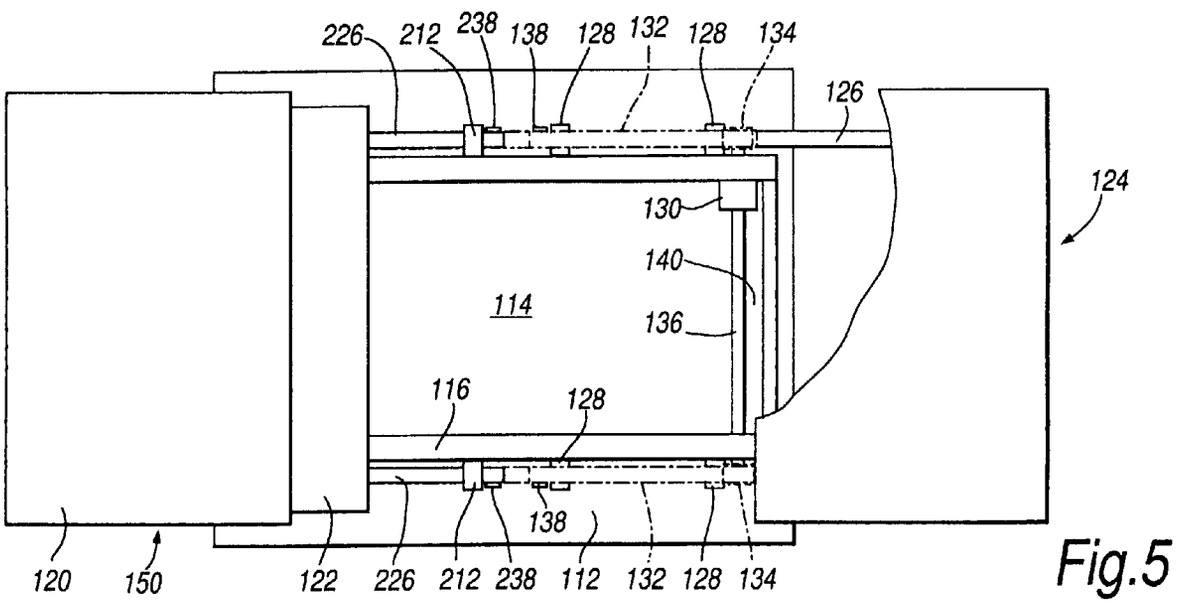

Fig.5

EP 0 919 778 A2

Description

[0001] This invention relates to vents and in particular, but not exclusively, to vents for mounting the roofs of factories, warehouses and the like to provide means for venting smoke and heat from the building in the event of a fire. They are also used to provide day to day ventilation in good weather.

[0002] Such vents generally take the form of a duct defining a vent passageway which provides a passageway from the interior of the building to the exterior of the building when installed in a roof opening. They also include a means for fully covering the vent passageway exit to prevent precipitation or birds, for example, from entering the passageway in a first operative position but which can be moved to at least a second operative position in which the vent passageway exit is not fully covered, to allow venting or day-to-day ventilation. There are usually provided intermediate positions of covering to provide a degree of control of the venting or ventilation through the vent passageway when not fully closed.

[0003] Known examples of such means for covering a vent include louvred glass panels or a sliding vent cover which is simply moved towards the side of the vent to expose some or all the vent passageway exit.

[0004] A disadvantage of known vents according to the preamble of claim 4 is that when the vent passageway exit is uncovered, even only partially to provide day-to-day ventilation it is difficult to prevent accumulated precipitation or animal or wind-borne debris from falling through the vent passageway into the interior of the building. This causes at least a nuisance in that the material has to be cleared up and in some cases also a health and safety hazard if floors are made slippery, for example. Also, day-to-day ventilation may not be possible if the weather is inclement, e.g. raining or snowing.

[0005] Accordingly, the present invention, in a first aspect, provides a vent comprising a duct defining a vent passageway having a vent passageway exit and a vent cover means movable between a first aperture position and a second operative position in which the vent passageway exit is fully covered and is not fully covered, respectively, characterised in that there is at least one aperture in a duct side wall which is closed when the vent covers means is in the first operative position and open to allow air to pass to or from the vent passageway through the aperture when the vent cover means is in a third operative position in which the vent passageway exit is also fully covered.

[0006] The aperture may be a through-hole of suitable cross-sectioned area to provide the required degree of ventilation or a slot formed by cutting a portion of the top of the duct wall back from the top edge.

[0007] When the vent cover is in the first operative position the vent passageway exit and the aperture in the duct side wall are both closed and so provides a closed vent through which air circulation is restricted or preferably totally prevented.

[0008] The vent of the present invention can provide day-to-day ventilation by moving the vent cover to the third operative position, in which position air can enter or exit a building through the duct via the aperture in the duct side wall while the vent passageway exit remains covered. This provides that accumulated precipitation, debris or currently falling precipitation, can be prevented from entering the vent passageway and the building while day-to-day ventilation is obtained via the now-opened aperture in the duct side wall.

[0009] Preferably the vent cover has a portion which abuts the duct side wall to close the aperture when in the vent cover means is in the first operative position. In this arrangement the aperture in the duct side wall is opened as the vent cover moves from the first to third operative position. Other arrangements for opening the aperture as the vent cover moves to a third operative, for example a flap valve operatively connected to the vent cover, can be readily devised.

[0010] The vent cover is preferably mounted on the housing by means of a pair of slider arms attached to the vent cover which are slidably engaged in guide means attached to the duct. These slide arms may be incorporated into the opening mechanism - e.g. in the case of linear actuators etc. This provides a self-contained vent which can be mounted to a roof opening without further roof mountings. Other methods of supporting the vent cover for movement relative to duct useful with the present invention are known and include tracks positioned underneath the vent cover along which it can slide between the closed and open position. In the preferred arrangement at least one, and more preferably both sliders are connected to an endless driving means, for example an endless driven belt or chain but other actuators such as linear actuators or a rack and pinion arrangement could be used to move the vent cover relative to the duct. Any convenient prime moves may be employed to move the vent cover or covers, e. g. an electric motor.

[0011] The vent may be provided with one or two vent covers. In the case two vent covers are provided, there may be an aperture associated with each of one or both vent covers to provide day-to-day ventilation.

[0012] As described earlier, vents with a single sliding vent cover are known in the prior art and it is know to mount them in a sloping roof with the vent cover slidable upwards and downwards over the vent. The force provided to move the vent cover between a first operative position and a second operative position in which the vent passageway exit is fully covered or not fully covered, respectively, must be sufficient to overcome the frictional forces associated with the vent cover movement as well as to overcome the weight of the vent cover when moving upwards.

[0013] The present invention also seeks to provide, in a second, independent aspect, a vent in which a lower maximum force is required to move the vent covers between the closed and non-closed positions for a given

length of vent cover means. Accordingly the present invention in the second aspect provides a first vent cover and a second vent cover which are interlinked so as to be constrained to move together either towards each other to cover the vent passageway exit or away from each other to uncover the vent passageway exit. Any suitable interlink may be employed.

[0014] On moving between the first and second operative positions, one vent cover will move upwards while the other moves downwards. Because they are constrained to move together i.e. tend to "balance" each other, the weight of the downward moving vent cover will assist the movement of the upward moving panel. Thus for a given total weight of vent cover, less maximum force is needed to move the cover and uncover the vent compared to a single prior art vent cover of the same total weight, all other things being equal.

[0015] It should be noted the first and second aspects of the present invention are entirely independent of each other: the present invention in its first aspect may be implemented with a single vent cover, the present invention in its second aspect need not have any aperture in the duct side wall to provide day-to-day ventilation in a third operative position. However, a preferred embodiment of the present invention in its second aspect includes all the features of the present invention in its first aspect.

[0016] Embodiments of the invention according to both the first and second aspects will now be described with reference to the accompanying drawings, of which:

Figures 1, 2 and 3 are a diagrammatic plan, side and end views of a vent according to the second aspect, only, of the present invention with the vent fully opened;

Figure 4 is a diagrammatic side view of the embodiment of Figures 1 to 3 but in the fully closed position; and

Figures 5 and 6 are diagrammatic plan and side views of a vent according to both the first and second aspects of the present invention.

[0017] Referring to Figures 1 to 4, a vent 10 has a mounting plate 12 with a rectangular aperture 14 for mounting the vent 10 to a structure such as the roof of a building in known manner. A duct 16, in this case of rectangular cross-section, is fixed to the mounting plate 12 surrounding the aperture 14 so defining a vent passageway with an entrance at the aperture 14 and an exit at the end of the duct 16 distal the aperture 14.

[0018] At one side of the duct 16 there is an open housing 18 fixed to the mounting plate 12 having a first section 20 and second section 22 stepped inward of the first section 20 at all points of its perimeter except for the edge fixed to the mounting plate 12.

[0019] A movable vent cover 24 is supported on the duct 16 by means of cantilever arms 26 each slidable within a respective pair of guides 28 mounted on the duct 16 for movement between the operative positions shown in Figures 2 and 4. In the position of Figure 2, the vent cover 24 does not fully cover the vent passageway exit: in the position of Figure 4 the vent cover 24 overlaps the second section 22 of the housing 18 whilst abutting the first section 20 so fully covering the vent passageway exit.

[0020] This movement of the vent cover 24 is obtained by an electric motor 30 mounted in the interior of the duct 16 which drives a pair of chain drives 32 mounted on opposite exterior sides of the duct 16 via a pair of driven gear wheels 34 and a common drive shaft 36. A pair of non-driven gear wheels support a respective one of the chain drives 32 beneath the housing 18 but are not shown in the illustrations.

[0021] The slidable cantilever arms 26 are attached to a respective chain drive 32 by a link 38.

[0022] The duct 16 is provided in one wall with an aperture 40, in this case formed as a slot, at the top of the duct 16 which is closed by a wall of the vent cover 24 when in the position of Figure 4 but is open when in the position of Figure 2.

[0023] The vent cover 24 is also movable to a position in which there is still an overlap with section 22 of the housing 18, thereby fully closing the vent passageway exit, but the aperture 40 is not closed by the vent cover 24 thereby allowing air to enter from beneath the vent cover 24 to enter the aperture 40 and so the duct 16 to provide ventilation while the duct is still fully covered by the vent cover 24,

[0024] Referring now to Figures 5 and 6, a vent 100 embodying the present invention in both its aspects includes a mounting plate 112 with a rectangular aperture 114 for mounting the vent 100 to a structure such as the roof of a building in known manner. A duct 116 of rectangular cross-section is fixed to the mounting plate 112 surrounding the aperture 114 so defining a vent passageway with an entrance at the aperture 114 and an exit at the end of the duct 116 distal the aperture 114.

[0025] A movable vent cover 124 is supported on the duct 116 by means of cantilever arms 126 each slidable within a respective pair of guides 128 mounted on the duct 116 for movement between the operative position shown in Figures 5 and 6 to a closed position. In the position of Figures 5 and 6, the vent cover 124 does not fully cover the vent passageway exit.

[0026] Movement of the vent cover 124 is obtained by an electric motor 130 mounted in the interior of the duct 116 which drives a pair of chain drives 132 mounted on opposite exterior sides of the duct 116 via a pair of driven gear wheels 134 and a common drive shaft 136.

[0027] A pair of non-driven gear wheels support a respective one of the chain drives 132 beneath a second vent cover 150 but are not shown in the illustrations.

[0028] The slidable cantilever arms 126 are attached to a respective chain drive 132 by a link 138.

[0029] The duct 116 is provided in one wall with an aperture 140 in the same location as the embodiment

of Figures 1 to 4 at the top of the duct 116 and which is similarly closed by abutment to a wall of the vent cover 124 when in the position analogous to that of Figures 3 and 4 but is open when in the position of Figures 5 and 6.

[0030] At the other side of the duct 116 from the vent cover 124 there is a second vent cover 150 having a first section 120 and second section 122 stepped inward of the first section 120 at all points of its perimeter except for the edge adjacent the mounting plate 112.

[0031] The vent cover 150 is movable from the position of Figures 5 and 6 by virtue of a similar mounting and drive arrangement as the vent cover 124, being supported by a pair of cantilever arms 226 fixed to the interior of the vent cover 150 and slidable within guides 212 fixed to the exterior of the duct 116. The cantilever arms 226 are attached by links 238 to the chain belt 132.

[0032] The vent covers 150 and 124 are constrained to move together but in opposite directions by virtue of the attachment of the respective supporting cantilever arms 226 and 126 to apposing sides of the chain drive 132.

[0033] The vent housings 124 and 150 are dimensioned such that when they are moved together fully the housing 124 overlaps section 122 of the vent cover 150 and abuts the section 120 of the vent cover 150 to cover the vent passageway exit. In this embodiment the vent cover means includes the two vent covers 124 and 150 which co-operate to cover the vent passageway exit as described.

[0034] The vent covers 124 and 150 can be moved apart from the abutting position just described to one where they do not abut but the vent cover 124 still overlaps the section 122 of the vent cover 150. In this position the vent passageway exit is still fully covered but the aperture 140 is now open to allow ventilation via the aperture 140 into the duct 116.

[0035] If the vent 112 is mounted on a sloping roof with the direction of movement of the vent covers 124 and 150 being up and down the slope of the roof, the weight of the vent cover which at any time is moving downwards will, by virtue of the fact the two vent covers are constrained to move together, assist somewhat movement of the vent cover upwards by the motor 130.

[0036] A seal may be included which is positioned to provide an airtight seal around the aperture when the vent cover or covers is in the third operative position with the vent passageway exit fully covered. This ensures the interior of a building is hermetically sealed from the exterior when the vent passageway exit is fully closed.

[0037] It will be appreciated the illustrated embodiment of Figures 5 and 6 show just one exemplary vent and method of constraining the vent covers to move together and that other configurations and drive mechanisms can be readily devised or adapted to implement the present invention.

Claims

1. A vent comprising a duct defining a vent passageway having a vent passageway exit and a vent cover means movable between a first operative position and a second operative position in which the vent passageway exit is fully covered or not fully covered, respectively, characterised in that:

   the vent cover means comprises a first vent cover and a second vent cover, which are interlinked so as to be constrained to move together, either towards each other to cover the vent passageway exit or away from each other to uncover the vent passageway exit.

2. A vent as claimed in claim 1 and mounted on a sloping roof.

3. A vent as claimed in claim 1 or 2 and including a seal means for hermetically sealing the apertures of the duct when the vent cover means is in the third operative position.

4. A vent comprising a duct defining a vent passageway having a vent passageway exit and a vent cover means movable between a first operative position and a second operative position in which the vent passageway exit is fully covered and is not fully covered, respectively, characterised in that there is at least one aperture in a duct side wall which is closed when the vent covers means is in the first operative position and open to allow air to pass to or from the vent passageway through the aperture when the vent cover means is in a third operative position in which the vent passageway exit is also fully covered.

5. A vent as claimed in claim 4 in which the vent cover means includes a vent cover having a portion which abuts the duct to close the aperture when in the vent cover means is in the first operative position.

6. A vent as claimed in claim 5 in which the vent cover is mounted on the duct by means of a pair of slider arms which are attached to the vent cover and slidably engaged in guide means attached to the duct and, optionally, including at least one an endless driving means supported by the duct, at least one slider arm being attached to the endless driving means, in which case, further optionally, in which each endless driving means is a chain supported by at least a pair of spaced apart cog wheels, in which case, yet further optionally, in which at least one of the cog wheels is a driven cog wheel connected to a motor.

7. A vent as claimed in any one of claims 4 to 6, in which the vent cover means includes a second vent

cover, one vent cover overlapping the other vent cover when the vent cover means is in the first and third operative positions.

8. A vent as claimed in claim 7, the duct having a second aperture in a duct side wall which is closed when the vent covers means is in the first operative position and open to allow air to pass to or from the vent passageway through the aperture when the vent cover means is in a third operative position in which the vent passageway exit is also fully covered.

9. A vent as claimed in claim 8 in which the second vent cover has a portion which abuts the duct to close the aperture when in the vent cover means is in the first operative position.

10. A vent as claimed in any one of claims 4 to 9 and in which the vent is also as claimed in any one of claims 1 to 3.

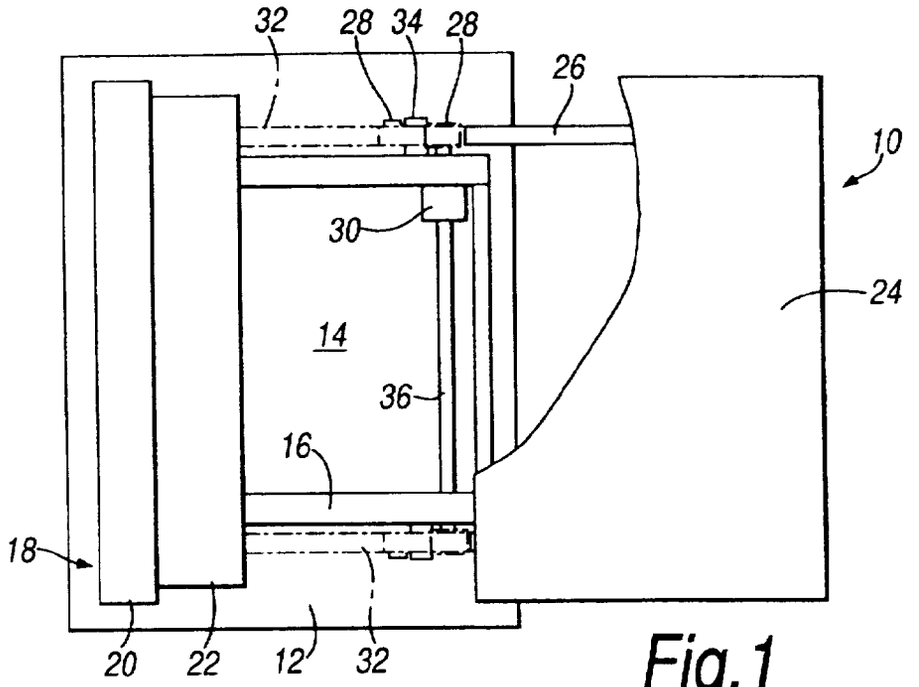

Fig.1

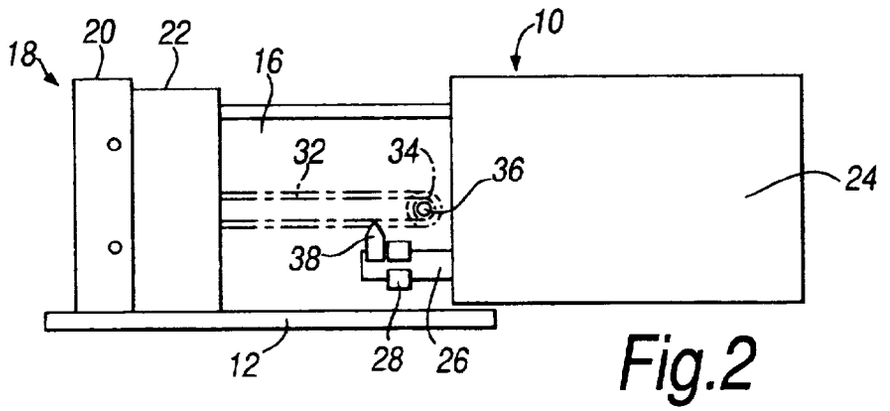

Fig.2

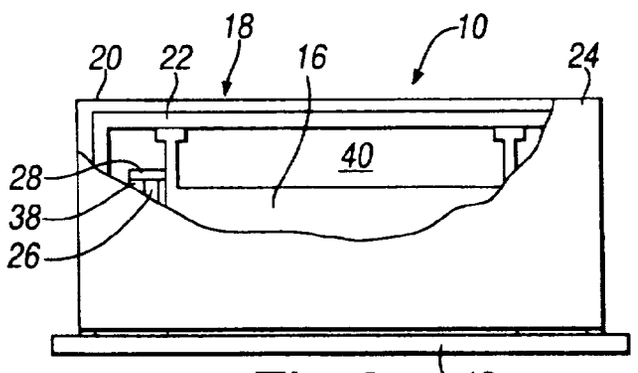

Fig.3

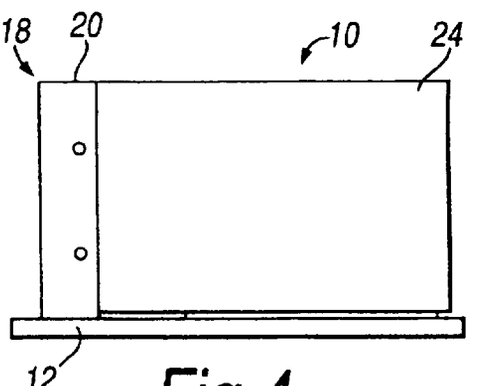

Fig.4

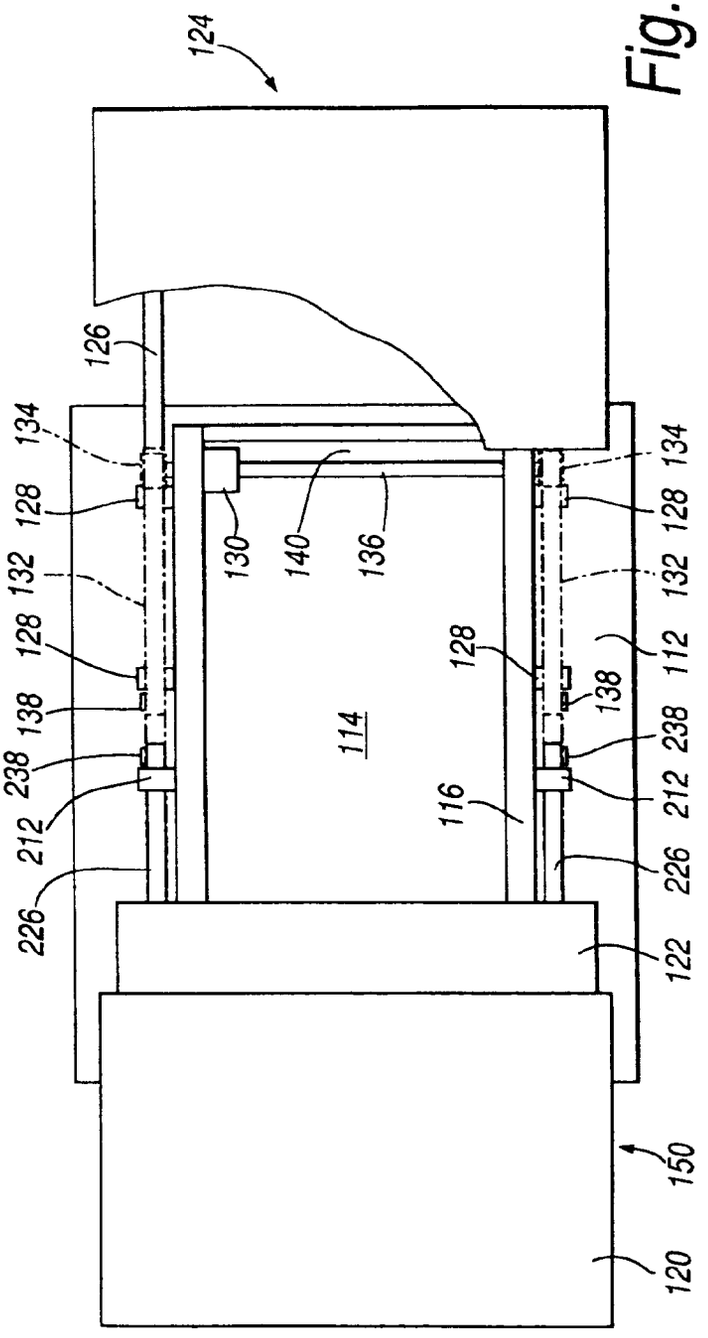
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Fig.5

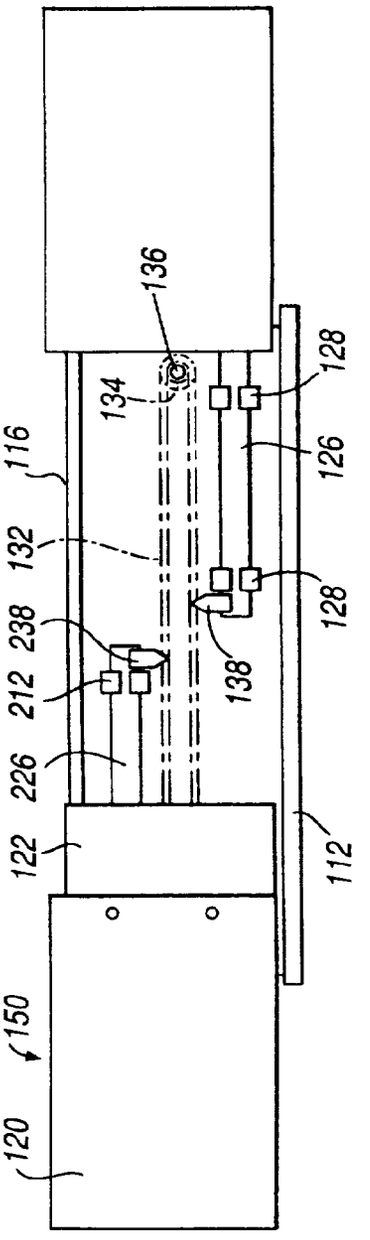
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Fig.6