(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 806 619 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
12.11.1997 Bulletin 1997/46

(51) Int. Cl.[6]: **F26B 21/00**, F26B 17/08

(21) Application number: **97106630.3**

(22) Date of filing: **22.04.1997**

(84) Designated Contracting States:
DE ES FR GB IT NL

(30) Priority: **09.05.1996 IT MI960934**

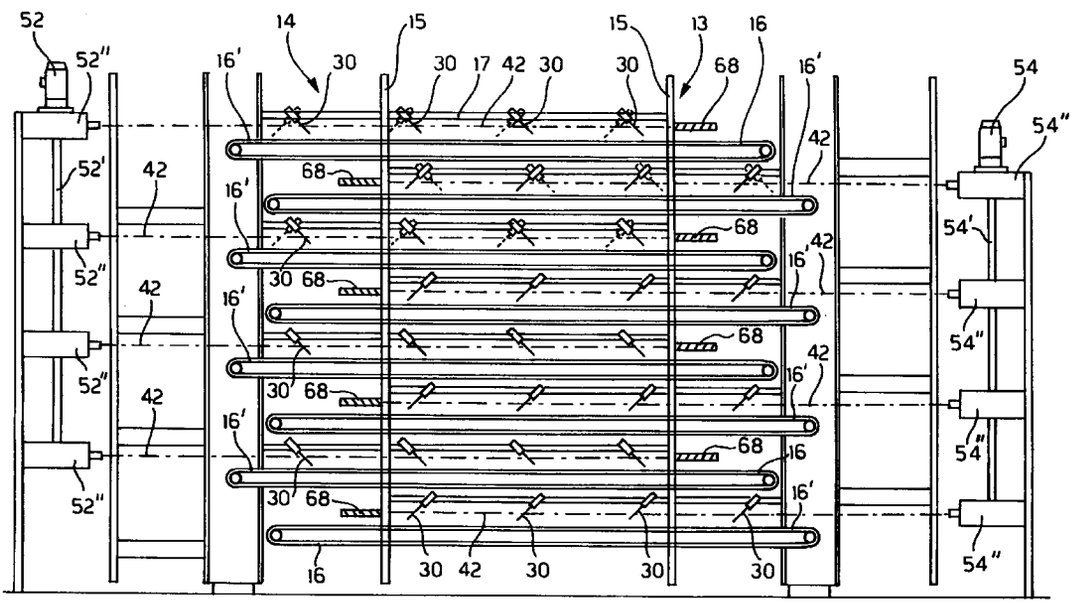
(71) Applicant:
TECNO IMPIANTI AVICOLI S.r.l.
35010 Marsango di Campo San Martino (Padova) (IT)

(72) Inventor: **Lago, Leopoldo**
35013 Cittadella, Padova (IT)

(74) Representative:
Petruzzelli, Antonio
European Patent Attorney
C.so Italia, No. 43
20122 Milano (IT)

(54) Improved framework for supporting droppings which can be used in a tunnel for drying droppings

(57) Equipment for storage and ventilation of droppings in a droppings drying tunnel (12), comprising a support structure (13) for a plurality of longitudinally extending surfaces (16) for supporting and holding droppings, wherefrom said droppings are periodically loaded and unloaded, and means of ventilation of the droppings. Said means of ventilation of the droppings comprise for each surface (16) for supporting and holding the droppings a respective set of ventilation blades (30) longitudinally aligned one in respect of the other and evenly spaced along said support and holding surface (16), and means for driving movement of said blades for ventilating the air inside said drying tunnel (12) over the droppings of the respective support and holding surface (16).



EP 0 806 619 A2

Description

The present invention relates to an improved framework for supporting droppings in tunnels or galleries for drying the same droppings.

Drying tunnels are constructions wherein the droppings, supported on suitable multilevel frameworks, remain in order to be dehydrated to an appropriate and required level of moisture in view of its reuse as fertiliser for farmland, ingredient of fodder for livestock etc.

The surfaces of the framework for supporting the droppings generally consist of conveyor belts which are driven to rotate during the operations of loading and unloading of the droppings. The droppings coming from the farm are generally unloaded on the upper conveyor belt and from there are then sent to the one below and so on to the next ones until they reach the lower surface from which, after the drying process has been completed, they are unloaded outside of said tunnel.

In order to accelerate the natural process of drying of the droppings according to a traditional procedure it was decided to ventilate the droppings remaining on the framework inside the tunnel.

Ventilation of droppings performed in known drying systems involved the blowing of air taken from the outside environment at one end of the tunnel and expelling of the air at the opposite end of the tunnel towards the outside.

This system of ventilation is disadvantageous from various points of view.

First of all, if the tunnel is long a considerable blowing power is required for preventing losses of load by the ventilation air along the route of the tunnel. This entails considerable running costs in order to supply the appreciable amount of energy required for blowing the air, and high building costs for the system, mainly relating to the high cost of equipment for blowing the ventilation air with high power to allow blowing of considerable air flows.

Moreover, with these known ventilation systems, ventilation does not take place in an even manner and the droppings near the source of blowing are in the end more dehydrated than those on the opposite side.

In other words unevenly dehydrated droppings are obtained which particularly in the case wherein they have to be processed later, for example in the case of use as raw material for animal fodder, creates problems in the subsequent processing phases of the same, and does not enable a final product with acceptable features to be obtained.

Moreover, in some systems of the prior art which use a single large blowing fan which serves all the surfaces, the ventilation air does not reach all the surfaces of the support framework evenly; the higher and lower surfaces may not be reached by a sufficient quantity of ventilation air.

Other known systems, in order to achieve even drying of the droppings which is substantially equal for each surface, use a blowing fan or the like for each surface, positioned at one end of the relevant surface, so that all the storage surfaces are covered by the same amounts of ventilation air. This however considerably increases the building costs of the plant due to the fact that the same number of powerful fans as the number of surfaces of the framework have to be provided.

Moreover the air charged with the moisture of the droppings expelled outwards is also impregnated with odours which are unpleasant and the source of conflict between the manager of the poultry plant and the surrounding population.

The use of air taken from the outside environment also creates a disadvantage in the winter months, when the outside air is cold and the fact of having to blow cold air over the droppings does not allow a good drying yield to be obtained, so that the times the droppings remain on the system have to be increased with subsequent increase in overheads.

The object of the present invention is that of providing a framework for drying droppings which can be used in a drying tunnel with which high drying yields are achieved without spreading unpleasant odours or incurring high building costs and overheads.

The previous object is achieved by providing, according to what is disclosed in claim 1, equipment or a framework for storage and ventilation of droppings in a droppings drying tunnel, comprising a support structure for a plurality of longitudinally extending surfaces for supporting and holding droppings, wherefrom said droppings are periodically loaded and unloaded, and means of ventilation of the droppings, characterised in that said means of ventilation of the droppings comprise for each surface for supporting and holding the droppings a respective set of ventilation blades longitudinally aligned one with the other and evenly distanced along said support and holding surface, and means for driving the movement of said blades for ventilating the air inside said drying tunnel over the droppings of the respective support and holding surface.

The arrangement on each surface for holding the droppings of means for ventilating the droppings using air inside said drying tunnel, due to the fact that cold air taken from the outside environment is not used and said air is not expelled towards said outside environment, provides a high drying yield of the droppings in every season of the year and prevents unpleasant smells from being spread outside of the tunnel.

Moreover the use of means for ventilation of the droppings, in particular in the form of ventilation blades evenly distributed along the support and holding surface, provides even and homogeneous drying of all the droppings inside the drying tunnel.

The present invention will in any case be made clearer on reading the following description, relating to a preferred embodiment of the invention and to be read with reference to the accompanying drawings, in which:

Fig. 1 is a schematic view in perspective of a tunnel for drying droppings housing a multilevel framework

for supporting the same droppings;

Fig. 2 is a schematic side view of a framework for drying droppings according to the present invention

Fig. 3 is a side section view of a detail of the drying framework of the present invention;

Fig. 4 is a cross section view of the droppings drying framework showing in particular a ventilation blade.

Fig. 1 illustrates a drying tunnel 12 containing the framework 14 for supporting the droppings.

The droppings, denoted by P in the drawings, are the result of defecation by poultry. The tunnel for drying droppings of the present invention has been devised with reference to a poultry plant, nevertheless it could also be used in any other type of animal breeding farm or in another situation wherein dehydration or drying of a material is required.

Said framework for supporting droppings comprises several surfaces 16 for holding the same droppings and, as shown in greater detail in Fig. 2, a support structure 13 composed of uprights 14, longitudinal rods 17 and cross members (not shown in the figures).

The droppings support surfaces 16 consist of conveyor belts which are driven to rotate by suitable drive means not shown in the figures during the operations of loading and unloading of the same droppings.

As shown in Fig. 1, the droppings coming from the farm 18 are transported via suitable belts and conduits 20 and are unloaded on the upper conveyor belt of the framework and from there are then moved to the underlying belt and so on to the next ones up to the last conveyor belt situated in the lowest position of the framework.

On completion of the drying process the droppings are expelled from the drying tunnel 12 and moved to a subsequent conveyor belt 22.

As shown in greater detail in Fig. 2, each belt 16 has a portion 16' projecting from the framework and suitable for receiving by falling the droppings transferred from the upper belt.

Such an arrangement for said belts 16 for the droppings is wholly traditional.

Naturally the present invention can also be applied to batteries wherein the route of the droppings is wholly different from that shown in Fig. 2.

As shown in the subsequent figures, according to the present invention said framework for drying the droppings 14 is provided with suitable means for ventilation over the droppings of air inside the drying tunnel.

In the preferred embodiment shown here, said means for ventilation of the droppings comprise a plurality of longitudinally aligned blades 30 above the unit for storage of the droppings to be dried. In Fig. 2 said blades 30 are shown also in a dotted line in order to give an example of the reciprocating motion they perform.

With particular reference to Figs. 2 and 3, it can be seen that each blade 30 is attached to the support framework, more particularly to longitudinal rods 17 thereof, so as to rotate freely around an axis transverse to the longitudinal axis of said storage unit and are moved by suitable means for actuating said blades according to a backward and forward reciprocating motion whereby air is sent, at the temperature of the air inside the tunnel, over the droppings being dried.

Said blade 30 has a transverse bar 34, connected rotatingly to the rods 17 by means of pins 36, and a first and a second panel for churning the air 38, which panels are arranged coplanar and adjacent one with the other and which are embedded by one of their upper ends in an appropriate transverse slot of the bar 34. Said panels are separated one from the other by a narrow central space 40.

The drive means of each set of blades 30 comprise a long longitudinal rod 42 which extends into the central space 40 for separation of said panels 38 of said blades 30.

The blades 30 are attached to the rod 42 by means of a cylindrical block 44 having two opposite layers 46 which contain the rod 42 and are moved close one to the other, blocking the rod 42, by means of suitable screws 48.

Said cylindrical block 44 is in turn fixed rotatingly to the transverse support bar 34 by means of a pin 50.

The reciprocal driving backwards and forwards of said rods 42 is actuated by means of suitable motor parts 52 and 54 located at the ends of the framework. Each drive motor has a respective drive shaft 52' and 54' which extends vertically and which drives respective rods 42 for moving the blades.

As shown, the shaft 52' of the motor 52, via suitable transmission parts 52", drives the rods for moving the blades for ventilation of the droppings of the first, third, fifth and seventh surfaces for holding the droppings, while the shaft 54' of the motor 54, via suitable transmission parts 54", drives the rods for moving the blades of the second, fourth, sixth and eighth surfaces for holding droppings.

As shown in detail in Fig. 2, the drive motors 52 and 54 are actuated in such a way that they impose opposing and synchronous movements on the respective sets of blades. Thus an effect of compensation of the actions which said ventilation systems discharge on the support structure is obtained.

The resulting actions which the blades of the first, third, fifth and seventh surfaces discharge onto the bearing structure are eliminated by the resulting opposite actions which the blades of the second, fourth, sixth and eighth surfaces discharge onto the structure.

The support structure is thus not involved by longitudinal oscillations which would otherwise be possible if the blades of all the surfaces were moved synchronously in the same direction. The structure must not therefore be anchored to the tunnel and the resistant sections thereof must be appropriately dimensioned

with smaller sizes, thus entailing lower construction costs of the system.

Naturally it could also be foreseen to use a single drive motor assisted by suitable means of transmission of the motion to the rods for moving the blades which enables the blades of adjacent holding surfaces to be actuated in an opposite way one to the other.

As shown in greater detail in Fig. 3, each rod 42 at the opposite end to that of driving is attached to the framework of said battery by means of a return spring 68 which pushes against a transverse rod 69 of the framework.

Overall said blade for churning the air 30 has a width almost equal to the width of the belt for storage of the droppings 22 of the drying section 20. This allows it to churn considerable quantities of air and to obtain appreciable drying yields without requiring a reciprocal motion of high frequency, with the advantage of not generating excessively disagreeable noises and not transmitting excessive vibrations to the support structure.

It must naturally be understood that what has been written and shown with reference to the preferred embodiment of the present invention has been given purely by way of a non-limiting example of the principle claimed.

Claims

1. Equipment for storage and ventilation of droppings in a tunnel for drying droppings, comprising a support structure (13) for a plurality of longitudinally extending surfaces (16)for supporting and holding droppings wherefrom said droppings are periodically loaded and unloaded, and means of ventilation of the droppings, characterised in that said means of ventilation of the droppings comprise for each surface (16) for supporting and holding the droppings a respective set of ventilation blades (30) evenly distanced along said support and holding surface and means for driving the movement of said blades for ventilating the air inside said drying tunnel over the droppings situated on the respective support and holding surface (16).

2. Equipment for storage and drying of droppings according to claim 1, characterised in that said longitudinally aligned blades (30) are arranged above the respective surface (16) for supporting the droppings to be dried.

3. Equipment for storage and drying of droppings according to claim 1, characterised in that each blade (30) of each set of blades is attached to the support structure (13) rotatingly and said means for driving movement of said blades actuate said blades according to a reciprocating backward and forward movement suitable for sending air over the droppings.

4. Equipment for storage and drying of droppings according to claim 1, characterised in that said blade (30) for churning the air is in the form of a wide air churning blade (30) having an overall width substantially equal to the width of the respective droppings storage surface (16).

5. Equipment for storage and drying of droppings according to claim 4, characterised in that said blade (30) for churning the air has a first and a second air ventilation panel (38, 38) arranged coplanar and adjacent one to the other and separated one from the other by a narrow central space.

6. Equipment for storage and drying of droppings according to claim 1, characterised in that said means of driving each set of ventilation blades comprise a long longitudinal rod (34) and jointed means (44) for fixing said blades (30) of the set of blades to said drive rod (34), as well as means of reciprocating backward and forward driving of said drive rod of the blades.

7. Equipment for storage and drying of droppings according to claim 6, characterised in that said means of actuating said drive rods (34) of said sets of ventilation blades (30) comprise a first drive motor (52) having a respective shaft (52') which extends vertically and respective means of transmission (52") of motion to respective sets of blades (30) of respective surfaces (16) for supporting and holding droppings, and a second drive motor (54) having a respective shaft (54') which extends vertically and respective means of transmission (54") of the motion to respective sets of blades (30) of respective surfaces (16) for supporting and holding droppings.

8. Equipment for storage and drying of droppings according to claims 1 or 7, characterised in that said means of driving said sets of ventilation blades (30) move sets of blades (34) of adjacent surfaces (16) for holding droppings in opposite angular directions.

9. Equipment for storage and drying of droppings according to claim 1, characterised in that said surfaces (16) for holding droppings comprise conveyor belts.

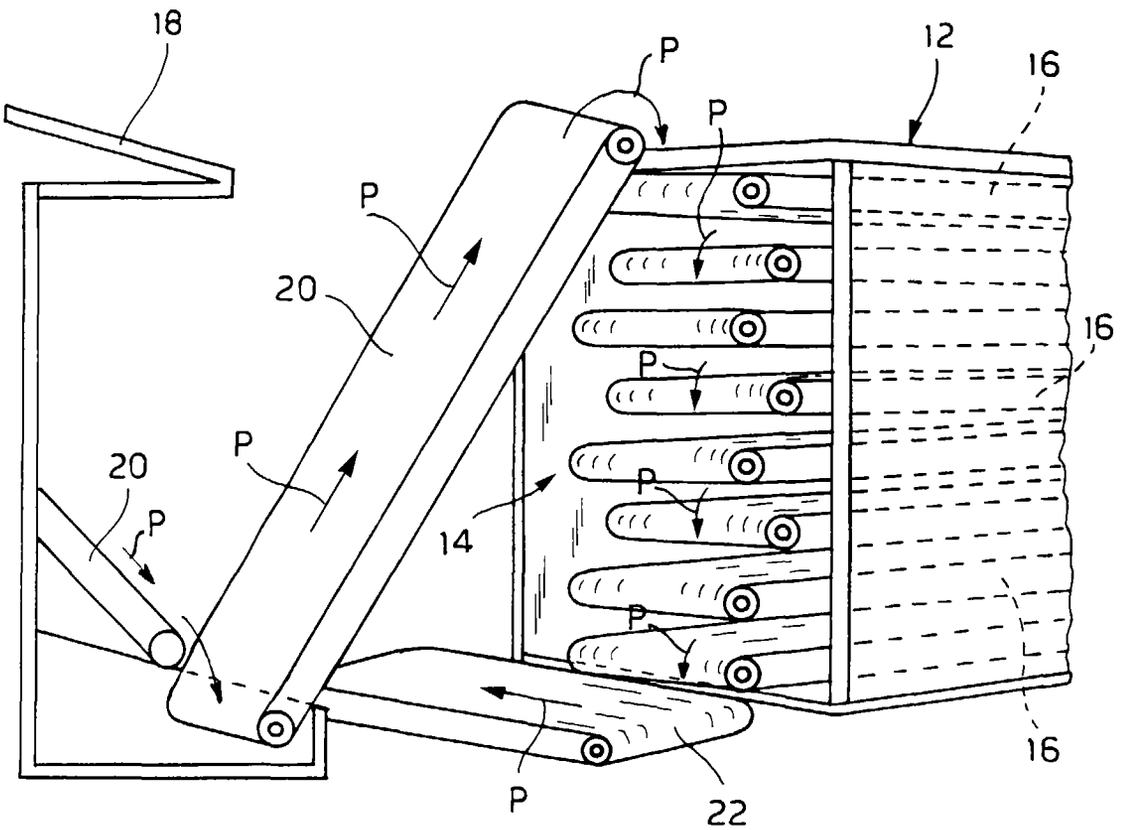


FIG. 1

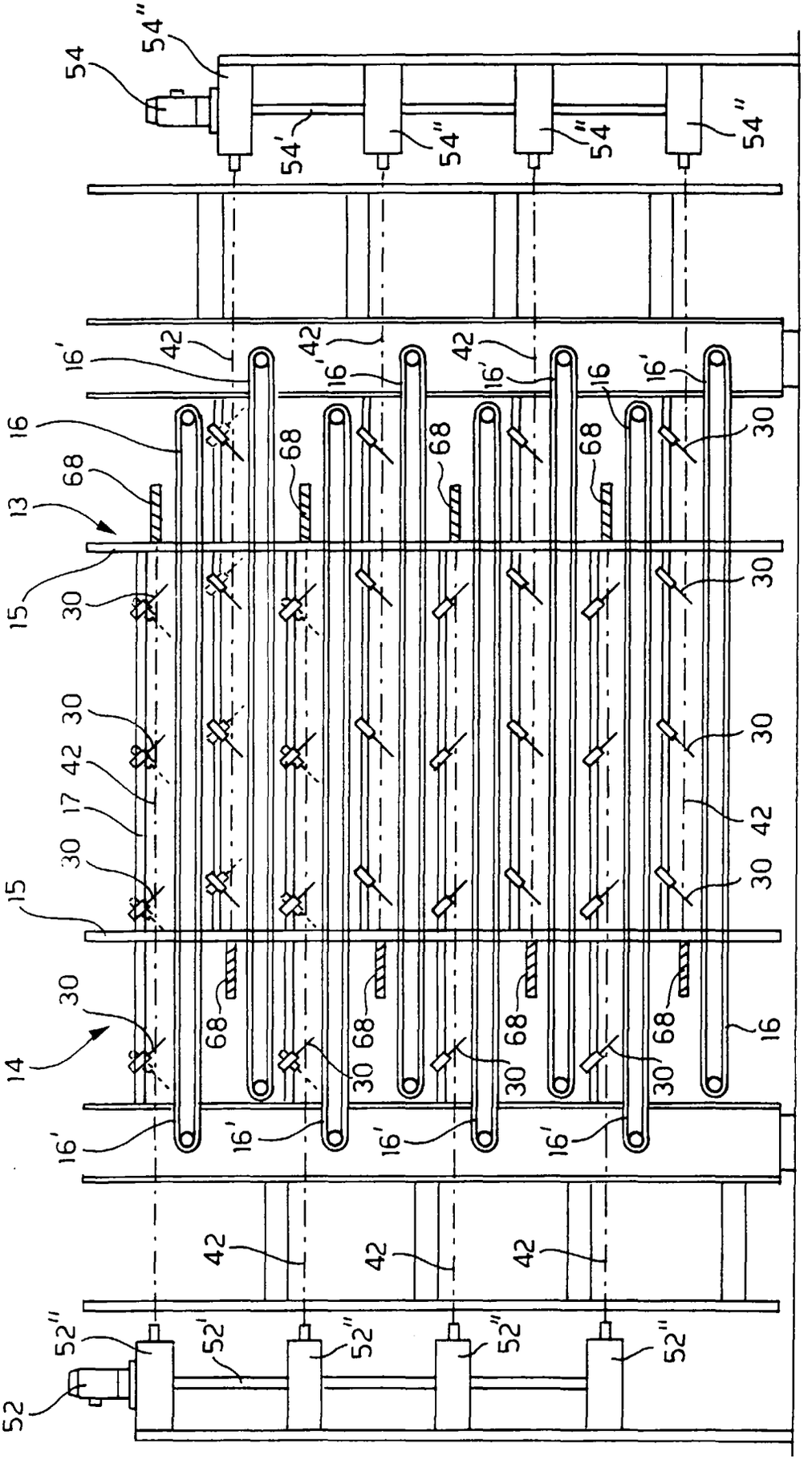


FIG. 2

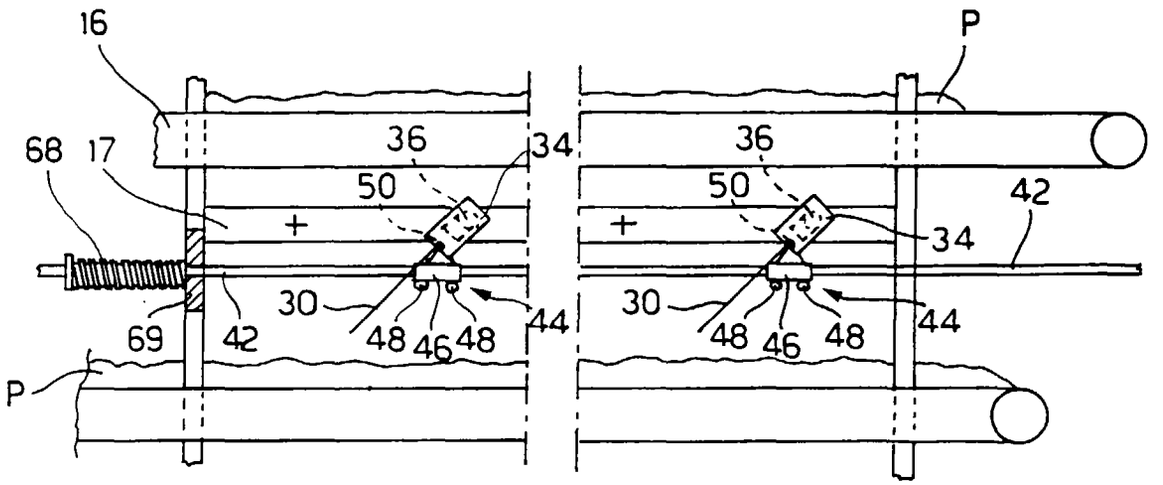

16
P
68
17
36
34
50
42
+
30
44
69
48
46
48
P

FIG. 3

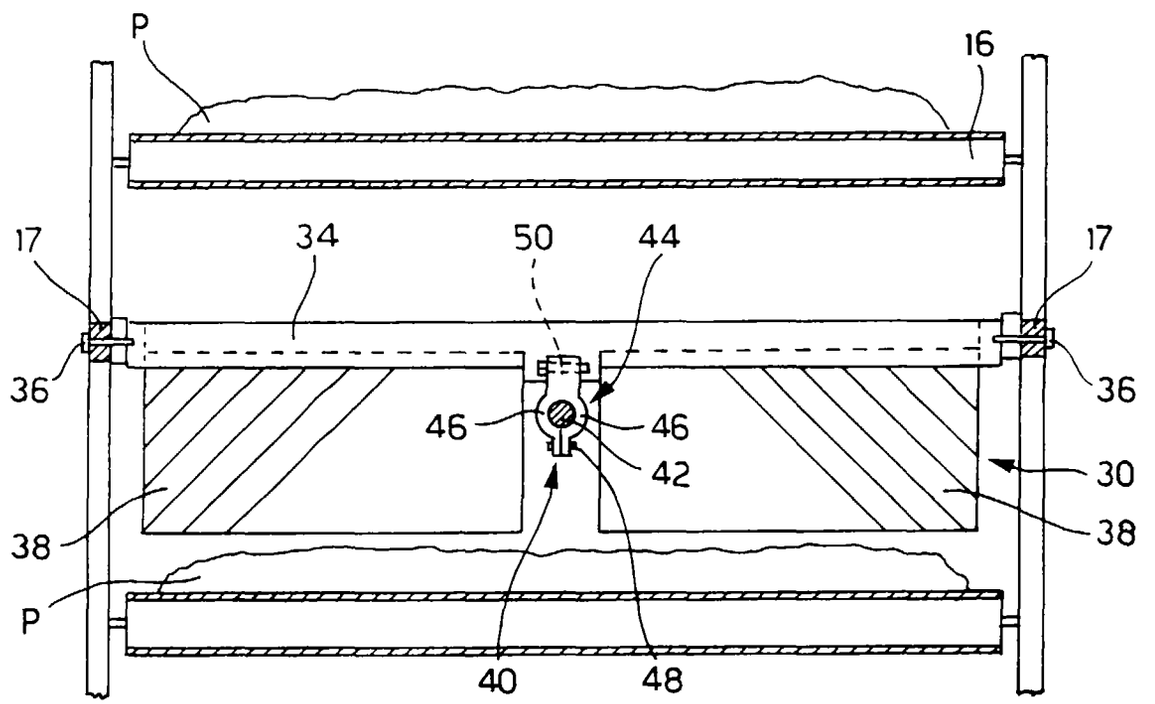

P
16
17
34
50
44
17
36
36
46
46
42
30
38
38
P
40
48

FIG. 4