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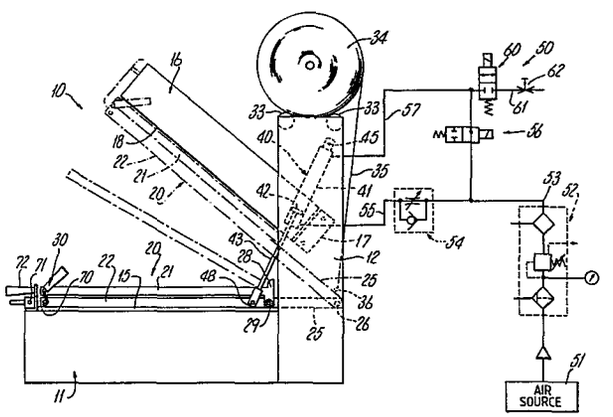
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(54) A skin packaging machine with inclined oven.

(57) A skin packaging machine (10) having a base (11), an inclined oven (16) above the base, and a film frame (20) pivoted to swing between positions adjacent the base and the inclined oven. The oven may have transverse elongated heating elements closely spaced at the lower end and widely spaced at the upper end to provide uniform heat across the surface of the oven. The frame (20) may have a pneumatic system for swinging it between its upper and lower positions in order to minimise the possibility of injury.



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This invention relates to a skin packaging machine.

Skin packaging machines generally have included a base presenting a horizontal foraminous surface with means for drawing a vacuum through that foraminous surface. A horizontal oven is spaced well above the foraminous surface. A horizontal frame is located between the base and the oven and is provided with a mechanism for raising and lowering the frame. A supply roll of film is provided adjacent the frame and the film is fed between two jaws which form the frame. That film is raised, by the frame, to a position adjacent the oven and when it becomes sufficiently heated to droop, the frame is lowered to bring the film down upon a substrate and an article placed thereon which is resting on the foraminous surface. A vacuum is applied to the foraminous surface and the substrate, thereby pulling the film snugly down onto the substrate and enclosing the article between the film and the substrate.

The frame must be mounted on special guides in order to keep it horizontally aligned with the oven and the base. Further, the space between the oven and the base is somewhat confining thereby making somewhat difficult the operations of the operator in placing a fresh substrate and article on the base and removing it after the packing operation has been completed

A general object of the present invention is to provide an oven wherein the necessity of the guides and expensive transmission for the frame is substantially eliminated, further to provide a greater access to the work space between the oven and the base and to provide a more uniform heating of the film when it is placed adjacent the oven.

This objective of the invention is attained in

accordance with the invention, by providing an oven whose opening is inclined at a substantial angle as, for example, 40° to the base. The frame is pivoted adjacent the lower end of the oven and is oriented so that it can swing from a horizontal position immediately overlying the base to an upwardly inclined position immediately adjacent the opening of the oven. By providing an inclined oven and a pivoted frame, the need for an expensive guide arrangement in order to maintain the frame in its horizontal attitude and aligned with the oven and base, is largely eliminated.

The upwardly inclined oven may itself present a problem in view of the tendency of the heat of the heating elements in the oven to rise. This problem may be overcome by providing the oven with elongated, spaced, parallel, horizontal heating elements. The heating elements at the lower end of the oven are more closely spaced than the heating elements at the upward end of the oven. With this configuration, the radiant heat applied to the film adjacent the oven opening is not uniform but the convection heat carried up from the more closely spaced heating elements at the lower end of the oven adds to the radiant heat in the upper end of the oven thereby making the total heat applied to the film generally uniform.

Another object of the invention is to provide a semi-automatic pneumatic system for raising and lowering the frame. The system of this feature of the invention, includes a ram formed by a piston and cylinder and a pair of valves for selectively controlling the application of air under pressure to both ends of the cylinder to raise and lower the frame with minimal pressure in either direction. Thus, the force on the operator's hand, should it be caught between the

frame and the oven or base, will be minimal.

Alternatively, a pneumatic spring may be substituted for the semi-automatic pneumatic system for raising and lowering the frame. The pneumatic spring is mounted so as to swing through an over centre position to urge the frame toward an upward direction on one side of the over centre position and to urge the frame against the base on the other side of the over centre position. When the frame is to be swung to a position adjacent the base, that operation is performed manually by the operator.

The invention will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a diagrammatic side elevation of an embodiment of skin packaging machine in accordance with the invention with the pneumatic system for raising and lowering the frame diagrammatically shown;

Figure 2 is a front elevation of the skin packaging machine;

Figure 3 is a front elevation of the oven;

Figure 4 is a cross-section taken along lines 4-4 of Figure 3; and

Figure 5 is a diagrammatic view of an alternative form of the invention.

Referring to Figures 1 and 2, the skin packaging machine, shown at 10, includes a base 11, the base including a pair of vertical plates 12 which are spaced apart for supporting other elements of the machine, as will appear below. A foraminous plate 15 forms the upper surface of the base. An inclined oven 16 is mounted on brackets 17 between the plates 12. The oven has a downwardly-facing opening 18 which lies at an angle of approximately 40^{o} to the

foraminous plate 15 on the base.

A frame or clamp 20 having an upper jaw 21 and a lower jaw 22 is pivotally mounted on the base and is adapted to swing from a horizontal position shown in full line to an upwardly-inclined position shown in phantom lines in Figure 1. The lower jaw has a rearward extension 25, the rearward end of which is pivoted at 26 between the vertical plates 12. By pivoting the lower jaw and hence the frame on an axis well to the rear of the foraminous surface and the oven, the angle through which the frame must swing and the angle of inclination of the oven can be minimised.

The upper jaw 21 has at its rearward end, a generally L-shaped bracket 28 which is pivoted to the lower jaw 22 to permit the upper jaw to swing from a horizontal position shown in full lines to an upwardly inclined position with respect to the lower jaw as shown in phantom lines in Figure 1. A torsion spring 29 is connected between the upper and lower jaws and normally urges the upper jaw toward an open position. A latch mechanism 30 mounted at the forward edge of the upper jaw and cooperating with the forward edge of the lower jaw in order to latch the upper and lower jaws together is provided.

At the upper portion of the vertical plates 12, a pair of trunions 33 are rotatably mounted to support a supply roll 34 of film 35. An idler roller 36 is provided adjacent the rear end of the frame 20 around which the film passes so that the film can be passed between the upper and lower jaws 21 and 22 of the frame 20.

A ram 40 consisting of a cylinder 41, a piston 42 and a piston rod 43 is connected between the base and the frame 20. More specifically, the cylinder 41

is pivotally connected at 45 to a bracket 46 mounted at the upper end to one of the plates 12. The piston rod 43 is pivoted at 48 to the lower jaw of the frame 20.

The cylinder 41 is connected to a pneumatic system 50 to cause the ram to extend in order to lower the frame to the full line position or to retract to raise the frame to the phantom line position of Figure 1. The pneumatic system includes a source of air 51 under pressure, the air under pressure being connected to a filter, regulator lubricator 52. The regulator 52 is connected through tubing 53 to a flow control valve 54 which is in turn connected through tubing 55 to the rod end of the cylinder 41.

A solenoid operated two-way valve 56 is connected by tubing 57 as well as the tubing 53 and 55 across the cylinder at its rod end and its piston end. A second solenoid operated two-way valve 60 is connected on one side between the first valve 56 and the piston end of the cylinder 40, the other side of the valve 60 being connected at 61 to atmosphere through a needle valve 62.

The operation of the pneumatic system is generally as follows: to extend the ram 40, the first valve 56 is shifted electrically from its normally closed position to its open position (shown). This applies the same regulated air pressure to both sides of the ram 40. The ram 40 extends because of the difference in area of the piston side of the ram versus the rod side of the ram. By operating the cylinder in this manner, the net thrust delivered by the rod extending will be the same as if the air pressure were applied only to the rod area, thereby substantially reducing the force with which the frame 20 will lower. This reduction in force will provide

the machine operator with a safety if the frame 20 were lowered onto some part of his body.

To retract the ram 40, the second valve 60 is shifted electrically from its normally closed position (shown) to its open position and valve 56 is closed. This releases the compressed air on the piston side of the cylinder and allows the ram 40 to retract by means of the air pressure on the rod side of the ram flowing through flow control 54, thereby raising the frame 20. The needle valve 62 controls the rate at which air escapes from the piston side of the ram to control the speed at which the frame rises. The filter regulator lubricator 52 is adjusted to the minimum pressure required to raise the frame 20 so that the frame will rise at a force consistent with the operator's safety.

If at any time the machine emergency stop button is pushed, both valves 56 and 60 will return to their normally closed position and the ram will stop at whatever point it is in its travel.

The oven, shown in Figures 3 and 4, has a generally flat pan-like support 64 containing a plurality of elongated, parallel heating elements 65 set in fuse mounts 66. The heating elements are preferably quartz tubes which are spirally wrapped in Nichrome ribbon as taught in United States Patent No. 3, 621,200. Each heating element is backed by a reflector 67. Ventilating vanes 68 may be provided at the reverse side of the oven from the opening 18 or alternatively the reverse side of the oven may be covered with an insulative material.

It can be observed that the heating elements are more closely spaced at the lower end of the oven than at the upper end of the oven in order that the combination of radiant heat from the heating elements

and convection heat from air flowing across the face of the oven will provide a more uniform overall heating of the film which is held against the opening of the oven on the frame 20. For a frame which is twenty-one inches wide and twenty-seven inches long, the representative spacing of the heating elements would be as follows:-

(a) 1 1/2 inches
(b) 4 1/8 inches
(c) 7 1/4 inches
(d) 10 3/4 inches
(e) 14 5/8 inches
(f) 18 7/8 inches.

At the front of the machine, provision is made for a knife 70 mounted on a rod 71, the knife having a handle 72. The function of the knife is to sever the film between a completed package and a fresh supply of film brought into the frame 20.

In the operation of the invention, film is drawn into the frame 20 and the frame is raised to the phantom line position. The operator, standing either at the front of the machine or to one side, places a substrate or card which is a porous board on the foraminous plate 15 and an article on top of the substrate. The oven is then energised and the heating elements heat the film until it becomes "droopy". When the film is ready, the pneumatic system is operated to lower the frame gently down upon the base to the full line posiition illustrated in Figure 1. Vacuum from a source, not shown, is applied to the foraminous plate which, through the porous substrate, draws the film down upon the substrate. A previously applied adhesive causes the film to adhere to the substrate.

When the package is thus formed, the operator opens the frame by raising the upper jaw to the position shown in phantom lines. The completed package is then

drawn from the machine toward the left as viewed in Figure 1. This operation simultaneously pulls a fresh supply of film over the lower jaw of the frame 20. The upper jaw is lowered to clamp the film between the two jaws and the handle 72 is manipulated to cause the knife to cut across the film between the package and the new supply of film in the frame 20. The controls are then operated to change the position of the valves in order to cause the frame to rise to the phantom line position adjacent the oven and the cycle of operations is repeated.

In an alternative form of the invention, instead of the ram 40, the apparatus can be provided with a pneumatic spring which normally urges the frame in the upper direction. In this embodiment, instead of having a pneumatic system, the frame is raised and lowered manually. To raise the frame, the latch mechanism adjacent the forward edge of the frame is released and the pneumatic spring will swing the frame to its upper position. When the film has become droopy through the heating of the film by the oven, the operator manually swings the frame to the horizontal position as illustrated in Figure 1 and relatches the frame to the base.

In an alternative form as shown in Figure 5, the pneumatic spring is mounted so as to swing through an over centre position to urge the frame toward an upward direction on one side of the over centre position and to urge the frame against the base on the other side of the over centre position. When the frame is to be swung to a position adjacent the base, that operation is performed manually by the operator.

Referring to Figure 5, a bracket 74 is mounted on the base at an elevated position with respect to the

pivot axis 26 of the frame 20. The pneumatic spring 75 is pivoted at 76 to the frame and at 78 to the bracket. The pneumatic spring consists of a cylinder 79 containing a compressed gas, a piston rod 80 and a piston (not shown) within the cylinder 79. The compressed gas normally urges the pneumatic spring to an extended position. As shown in phantom lines, the pneumatic spring will urge the frame 20 to an upward position and hold it there against the oven 16. When the frame is manually pulled down against the base 11, the pneumatic spring swings through an over centre position in which the three pivot points 26, 76 and 78 are in alignment to the lower position in which the frame 20 lies upon the base 11. In that position, the pneumatic spring urges the frame in a downward direction, thereby holding the frame against the base.

In operation, the operator merely has to lift the frame with sufficient force to overcome the pneumatic spring until the pneumatic spring passes the over centre position. Thereafter, the spring moves the frame upwardly. Similarly, to lower the frame, the operator must overcome the force of the pneumatic spring to pull the frame down upon the base 11. When the pneumatic spring passes through the over centre position, the spring takes over to complete the movement of the frame onto the base.

CLAIMS

1. A skin packaging machine having a substantially horizontal porous base surface to receive a porous board and an article to be packaged, an oven mounted above the base surface and having a downwardly facing opening through which heat from heating elements can be directed characterised in that the opening (18) is inclined both to the horizontal and vertical and in that a frame (20) which is adapted to carry a film, is pivotally mounted for movement between a position adjacent the horizontal base (11) and a position adjacent the opening (18) of the oven (16).

2. A packaging machine as claimed in Claim 1 having means to mount a supply roll (34) of film above and adjacent to the oven (16) the film being enabled to be fed into the frame (20) adjacent the pivoted end of the frame.

3. A packaging machine as claimed in either Claim 1 or 2 wherein the pivot axis (29) of the frame (20) is positioned well to the rear of the porous base surface (15) and of the oven (16) to minimise the angle through which the frame swings and the angle of inclination of the oven.

4. A packaging machine as claimed in any of the preceding claims in which the oven opening (18) is positioned at an angle of about 40^{o} to the horizontal.

5. A packaging machine as claimed in any of the preceding claims wherein the oven (16) is provided with a number of horizontal elongated parallel disposed heating elements (65), the heating elements being spaced apart by gradually increasing distances from the relatively lower end to the relatively upper end of the inclined oven (16).

6. A packaging machine as claimed in any one of the preceding claims wherein a pneumatic spring is connected between the base and the frame.

7. A packaging machine as claimed in Claim 6 wherein the pneumatic spring (75) is mounted so as to swing through an over centre position to urge the frame (20) in an upward direction on one side of the over centre position and to urge the frame against the base on the other side of the over centre position.

8. A packaging machine as claimed in any one of Claims 1 to 5 having a pneumatic system for raising and lowering the frame comprising a cylinder and piston combination (40) connected between the base (15) and frame (20), the cylinder (41) being connected to a source of pressurised air (51), valve means being provided selectively to connect the source (51) of pressurised air to both sides of the piston (42) to extend the piston rod (43) to lower the frame towards the base and to the piston rod side of the piston to retract the piston rod (43) to raise the frame.

9. A packaging machine as claimed in Claim 8 wherein the valve means comprises a first valve and tubing connected to both ends of the cylinder, a second valve and tubing connected on one side between said first valve and the piston end of the cylinder and on the other side to atmosphere, the air source being connected between the first valve and the rod end of the cylinder, whereby closing the second valve and opening the first valve will apply air under pressure to both sides of said piston to cause said ram to extend; closing of said first valve and opening said second valve will cause said ram to retract; and closing of both valves will cause said ram to stop movement.

10. A packaging machine as claimed in Claim 9 wherein

a flow control unit is connected at one side to the rod end of the cylinder and at the other side between the air source and the first valve.

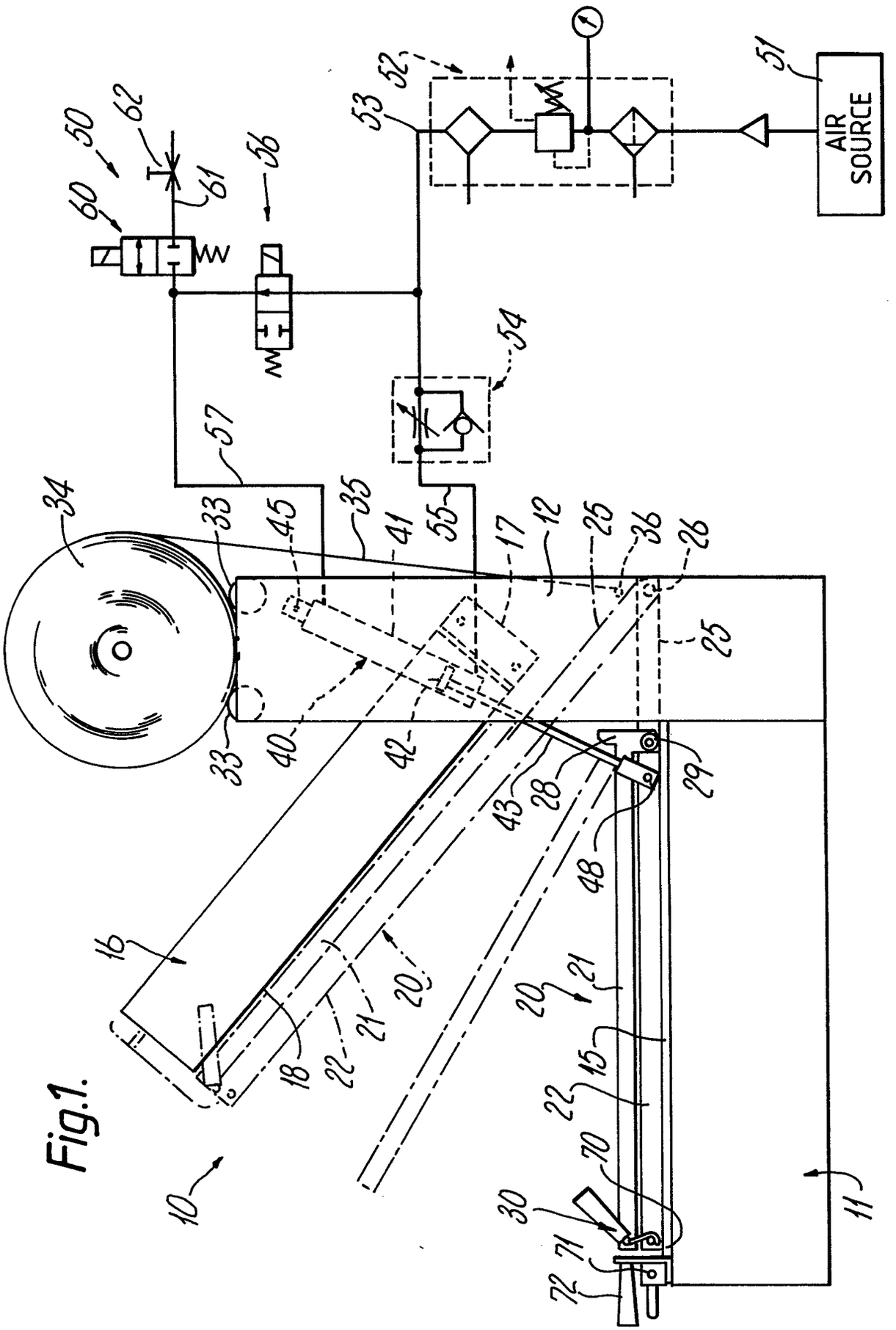

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Fig.1.

Fig.2.

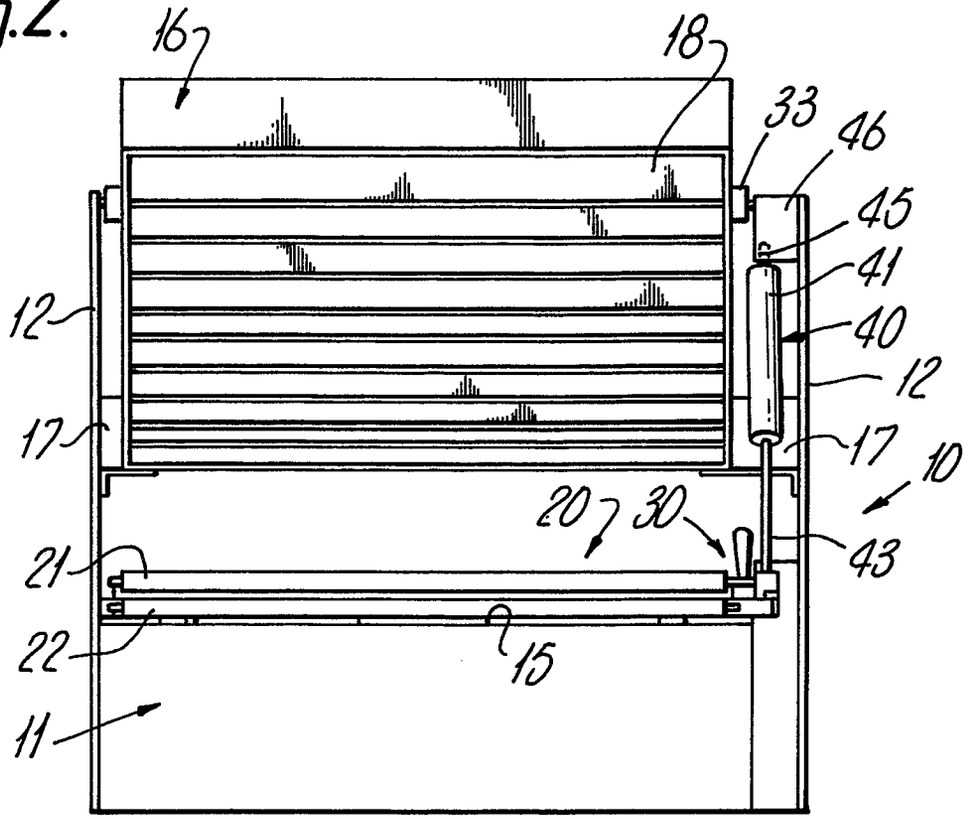


Fig.3.

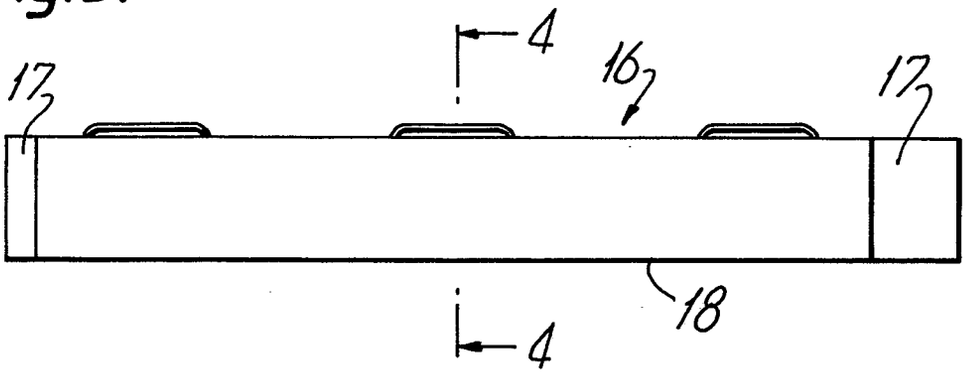


Fig.4.

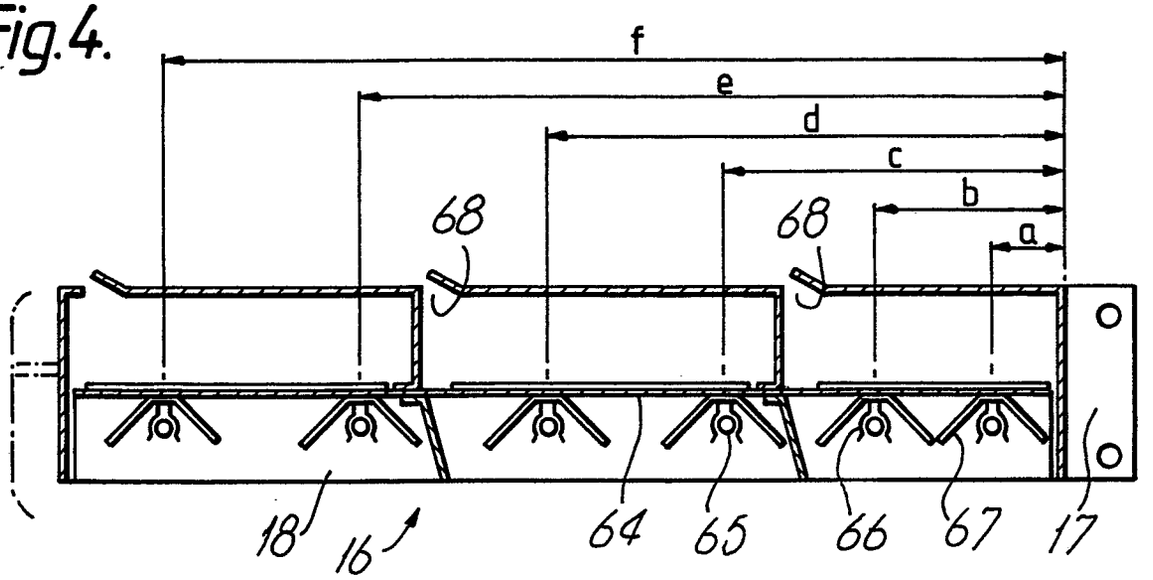
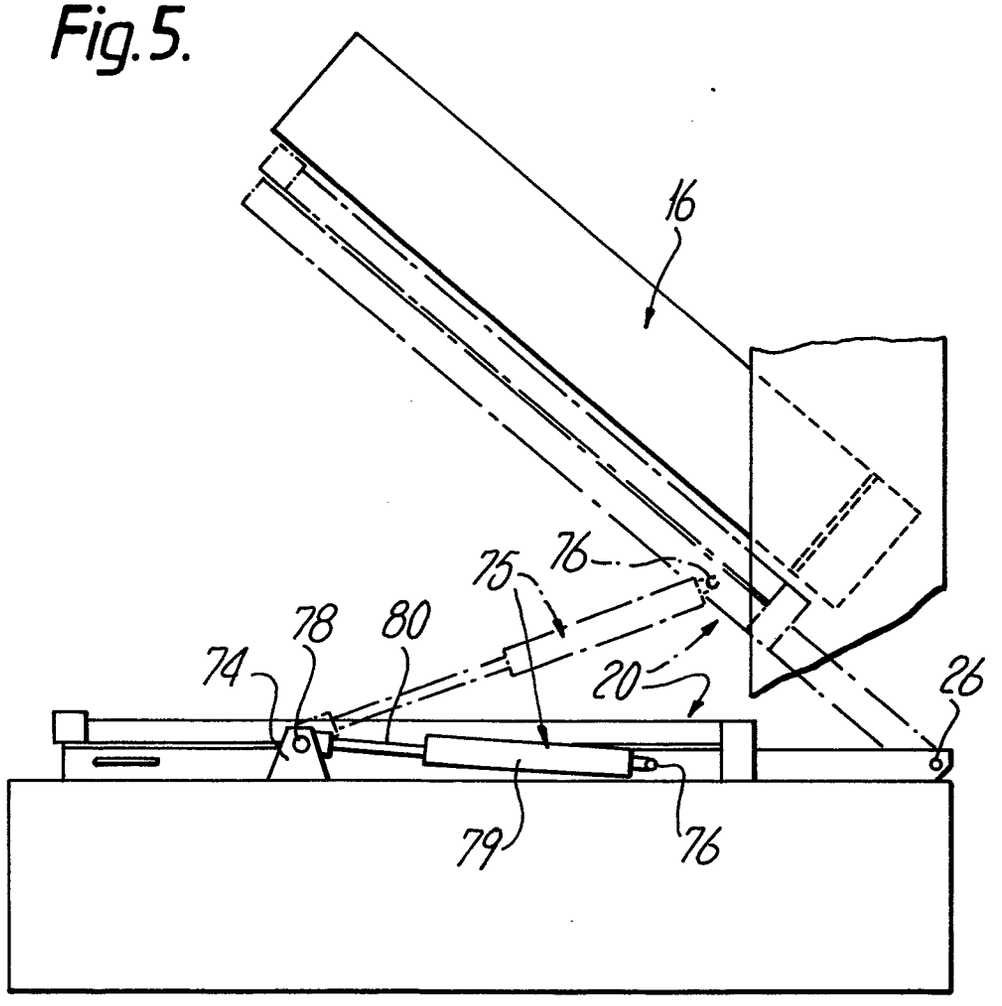


Fig.5.



0066941

Application number

EP 82301889.0

European Patent Office

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	DE - B - 1 962 802 (STONE CONTAINER CORPORATION) --	
A	US - A - 3 377 770 (RORER) --	
A	US - A - 3 501 886 (WATTS) ----	

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

B 65 B 11/52

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

B 65 B 11/00
B 65 B 31/00
B 65 B 53/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same category
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	16-09-1982	MELZER