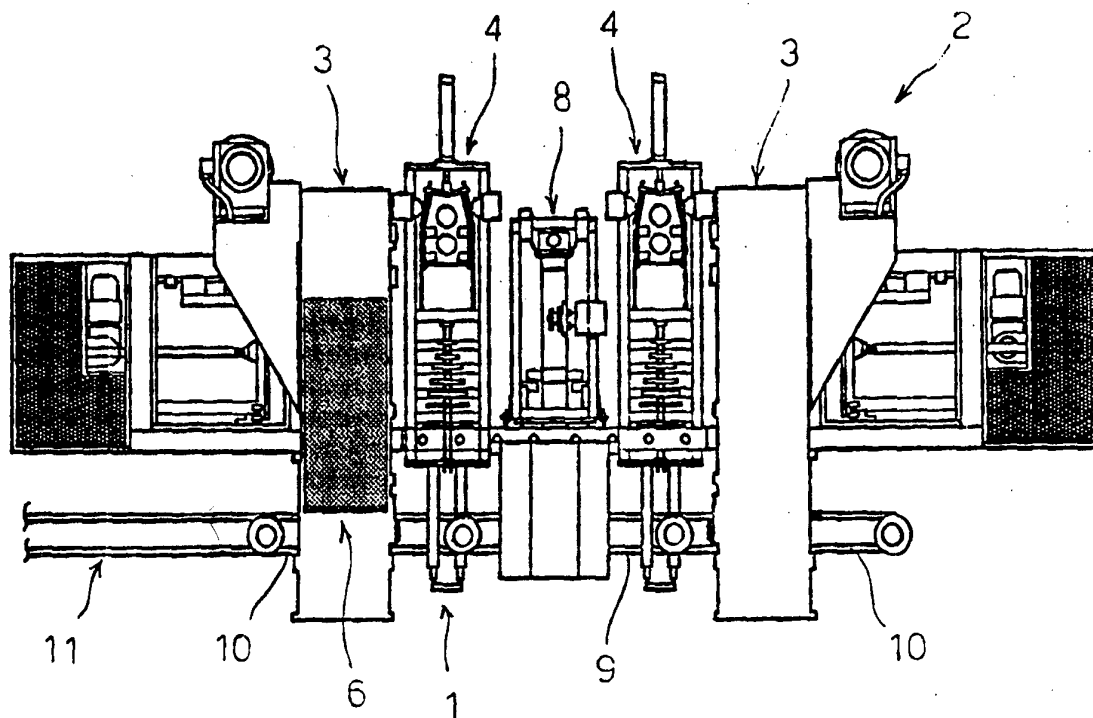




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/SE93/01014 (22) International Filing Date: 25 November 1993 (25.11.93) (30) Priority Data: 9203561-7 26 November 1992 (26.11.92) SE (71) Applicant (for all designated States except US): ABECE AB [SE/SE]; S-610 53 Enstaberga (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): RASIN, Bengt [SE/SE]; Teatergatan 8, S-611 31 Nyköping (SE). (74) Agent: WÄRULF, Olov; Oxelösunds Patentbyrå HB, Sköldvägen 36, S-613 37 Oxelösund (SE).</p>		<p>(81) Designated States: JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Swedish).</i></p>

(54) Title: DEVICE FOR FEEDING ROOF TILES TO A LOADER FOR A STACKING UNIT



(57) Abstract

Apparatus for the feeding of preferably cured roof tiles (7) fed from an infeed conveyor (1) on to a stacking unit (2) comprising at least one rising conveyor (3), showing two parallel rising belts (5), arranged on each side of the infeed conveyor (1) and upholding opposing support shelves (6), onto which the roof tiles are lifted from the infeed conveyor (1). A part (10) of the infeed conveyor or parts of its frame (14) are vertically adjustable in relation to the rising conveyor (3) whereby roof tiles (7) with different profiles may be aligned on the appropriate level in relation to the support shelves (6).

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DEVICE FOR FEEDING ROOF TILES TO A LOADER FOR A STACK-  
ING UNIT.

#### TECHNICAL FIELD

5                   This invention concerns a device for the  
feeding of, preferably, cured roof tiles, fed from an  
infeed conveyor on to a stacking unit comprising at  
least one rising conveyor, showing two parallel rising  
belts arranged on each side of the infeed conveyor and  
10                   upholding opposing support shelves, onto which the roof  
tiles are lifted from the infeed conveyor to be stepwise  
conveyed upwards the rising conveyor. The infeed  
conveyor shows conveyance elements such as conveyor  
belts or haulage cables on which the roof tiles are  
15                   carried up during their conveyance forwards towards the  
rising belts.

#### TECHNICAL BACKGROUND

                  In a stacking unit in accordance with the  
preamble above, an accurate synchronisation must be  
20                   achieved between the conveyance speed of the conveyor  
belt or haulage cable of the infeed conveyor and the  
successive vertical conveyance from the infeed conveyor.  
A roof tile, conveyed between the rising belts in a  
rising conveyor should, thus, exactly at the right  
25                   moment, be lifted from the infeed conveyor by a pair of  
opposing support shelves on the rising belts, so that  
the shelves engage each long-side edge of the tile, to  
lift it from the infeed conveyor. For this to be done  
without damaging the tile's long-side edges the support  
30                   shelves must be brought into position directly under the  
long sides of the roof tile exactly at the right moment  
for the lifting operation. This means that a thorough  
adjustment of the support shelves' positioning in  
relation to the roof tile to be lifted, must take place  
35                   for each new cross-section/profile of roof tiles to be  
stacked in the stacking unit. Readjustments in the

production of roof tiles from one profile to another demand consequently a very accurate adjustment of the infeed conveyor in relation to the lifting position of the rising belt.

5 DESCRIPTION OF THE INVENTION

The purpose of this invention is to produce an apparatus for the feeding of, preferably, cured roof tiles, fed from an infeed conveyor on to a stacking unit, which makes it easier to adjust from one tile profile to another in the case of production readjustments. The stacking unit comprises at least one rising conveyor, showing two parallel rising belts arranged on each side of the infeed conveyor and upholding opposing support shelves, onto which the roof tiles are lifted from the infeed conveyor. According to the preferred embodiment the apparatus is characterised in that a part of the feeding conveyor or parts of its frame are vertically adjustable in relation to the rising conveyor whereby roof tiles with different profiles may be aligned on the appropriate level in relation to the support shelves in the case of production readjustments from one profile to another.

Preferably, the parts of the frame are individually adjustable vertically, but may even be sideways displaced individually, normal to the tiles' main conveyance direction on the infeed conveyor. Preferably, each respective part of the frame upholds at least one conveyance element such as a conveyor belt or haulage cable on which tiles are conveyed, and is connected by means of control elements and level regulation elements to a foundation common to both the infeed conveyor and the rising conveyor. The level regulation elements may, in that case, comprise at least one master cam for respective part of the frame and at least one holding on element arranged in connection with it. In a preferred embodiment of this invention one or

several master cams may be arranged on a rail with restricted guidance in its longitudinal direction, and in connection with one holding on element, arranged for each master cam on respective part of the frame, which may, by way of example, comprise a wheel. Control elements may comprise guides, in which the legs arranged for respective parts of the frame are vertically displaceable. It is, however, in accordance with this invention to allow control elements that comprise other elements, such as swinging arms, by means of which the frame may be brought into restricted vertical rotation.

In a preferred embodiment a rail is extended alongside each of the parts of the frame of the infeed conveyor, whereby each rail upholds two master cams for each part of the frame. Respective part of the frame is thus to be supported against a couple of master cams on respective rail. Preferably, respective master cam comprises a stepped wedge, whereby determined positions in regard to the rails correspond with determined levels of the conveyance elements supported by the parts of the frame that may thereby be simultaneously adjusted through the displacement of the rails in their longitudinal direction. The adjustment positions of the rails are achieved by means of a driving arrangement controlled by conventional control arrangements.

#### DESCRIPTION OF THE ACCOMPANYING DRAWINGS

The invention is described in the following, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows schematically a stacking unit for cured tiles, comprising two rising conveyors, in which the unit is viewed normal to the tiles' main conveyance direction.

Figure 2 shows a detail of one of the rising conveyors shown in figure 1

Figure 3 shows a magnification of a roof tile to be lifted from the belt conveyor onto the rising conveyor in accordance with figure 2.

Figure 4 shows a more detailed view of a feed in arrangement onto the rising conveyors shown in figure 1.

The arrangements shown in the figures are part of a plant for concrete roof tile manufacture, in which roof tiles, after having been cured and depalleted from the metal pallets on which they were carried up during curing time, are conveyed on an infeed conveyor 1 in the direction of the arrow as in figure 1 onto a stacking unit 2 comprising two rising conveyors 3 and two collecting units 4. In the rising conveyors 3 the tiles are lifted from the infeed conveyor 1 by means of successive conveyance upwards by the two parallel rising belts 5 as shown in figure 4. Respective rising belt 5 runs in a closed course on both sides of the infeed conveyor 1 and shows opposing support shelves 6 onto which one roof tile 7 at a time is lifted from the infeed conveyor 1. When the beforehand determined number of tiles 7 is lifted from the infeed conveyor 1 the rising belt 5 in the first rising conveyor 3 is stopped, whereby the rising belt 5 in the second rising conveyor 3 starts running and lifting tiles 7 from the infeed conveyor. The stack of roof tiles 7 in the first rising conveyor 3 is later displaced to a first collecting unit 4, in which the tiles 6 are piled up so that the pieces are in contact with each other, later to be conveyed on to a feeding out carriage 8 by means of which the tile pile 7 is conveyed on to a packaging station. The course of events is then repeated alternately between the first and the second rising conveyor's 3 corresponding collecting unit 4 respectively.

The infeed conveyor 1 that shows schematically in figure 1 comprises a fixedly mounted main part 9,

extending between the rising conveyors 3, and two vertically adjustable parts 10, extending from one side, right through and partly projecting into the other side of the rising conveyors respectively 3. Furthermore, one  
5 of the vertically adjustable parts 10 is in connection with a forwarding conveyor 11, schematically shown in figure 1, on which cured roof tiles 7 are conveyed forward towards the infeed conveyor 1. The forwarding conveyor's 11 as well as the infeed conveyor's 1 parts  
10 9, 10 show an haulage rope 12 of plastic material on which the tiles 7 rest during conveyance, as shown in figure 3. The haulage ropes 12 run at the same speed in the sliding pieces 13 alongside the different paths, in step with the movement of the rising belts 5.

15 A first vertically adjustable part 10 of the infeed conveyor 1 is shown in figure 4, comprising two framework parts 14 that are vertically adjustable in relation to a foundation 15. It is, however, in accordance with this invention to arrange three, or even  
20 more, framework parts 14 close to each other in the respective vertically adjustable part 10 depending on the shape of the roof tiles. Respective framework part 14 upholds two pulley wheels 16 at each end, over which an haulage rope 12 runs on sliding pieces 13 alongside  
25 the framework parts 14 respectively. Respective frame part 14 is in vertically moveable contact with the foundation 15 through the two legs 17, arranged at a distance from the framework's 14 ends, whereby each leg 17 runs on a guiding arrangement 18 comprising fluted  
30 guide wheels 19, which is fixedly mounted to the foundation 15. The frame of the guiding arrangement 18 also upholds supporting wheel 20 for the rail 21 that runs in the same direction as the respective framework part 14 on the vertically adjustable part 10 of the  
35 infeed conveyor 1, and which is equipped with a cam 22 for each leg 17 that supports against the respective cam

22 with the, on that leg, arranged holding on wheel 23. Respective rail 21 is horizontally displaceable in the longitudinal direction of the infeed conveyor 1 by means of a screw device 24, attached partly to the foundation 15 and partly to the rails 21. It is, however, in accordance with this invention that respective rail 21 may be adjusted separately by means of a separate screw device 24 for each part of the framework 14.

Respective part of the frame 14 may even be sideways displaceable, normal to the tiles' 7 main conveyance direction, to allow for greater flexibility in regard to the adjustment of the roof tiles' positioning in relation to the support shelves 6 on the rising belts 5. Such adjustment is made possible due to side shifting of the respective guiding arrangements 18, not shown in the figures, towards optional positions or beforehand determined positions with maintained parallelism between the conveying elements 12 on respective parts of the frame 14. The corresponding frame parts 14 in the vertically adjustable parts 10 on the respective rising conveyor 3 are, thus, adjusted alike. It is, however, in accordance with this invention to use different vertical adjustments as well as for lateral displacement with the two parts 10 of the very same infeed conveyor 1.

Respective master cam 22 shows steps connected through inclined parts, by means of which the holding on wheels 23 and with those respective parts of the frame 14 can be brought into varying vertical intervals in relation to the foundation 15. Through the vertical adjustment of the position of the respective frame part 14 the positioning of the parallel edge sides of the roof tiles 7 that are in the course of conveyance on the haulage cables 12, is adjusted to the position of that pair of support shelves 6 on the rising belts 5 in turn to be lifting a tile 7 from the haulage cable 12 on the



vertically adjustable part 10 of the infeed conveyor 1. In the embodiment according to figure 4 respective master cam 22 shows five stepped levels, corresponding with five different shapes of roof tiles 7. Respective part of the frame 14 in the two vertically adjustable parts 10 of the infeed conveyor 1 is simultaneously adjustable for height as respective rail 21 extends alongside the whole of the infeed conveyor 1 and upholds cams 22 for all legs 17 of the framework parts 14 in both parts 10. By replacing the rails 21 and the cams shown in figure 4 with different rails that show master cams with differently stepped levels, the infeed conveyor 1 may be adjusted to fit additional shapes of roof tiles. Respective master cam 22 can show a straight shaped wedge-form but also different shapes of a curve. The master cams 22 may well be removeably fitted on the rails 21, which makes it easier to adjust the infeed conveyor 1 to different shapes of tiles.

It is, however, in accordance with this invention that it is also to be utilised in different embodiments of rising conveyors and even with other embodiments of rising arrangements that correspond to the rising belts in such rising conveyors as the above depicted.

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## CLAIMS

1. Apparatus for the feeding of, preferably cured roof tiles (7) fed from an infeed conveyor (1) on to a stacking unit (2) comprising at least one rising conveyor (3), showing two parallel rising belts (5), arranged on each side of the infeed conveyor (1) and upholding opposing support shelves (6), onto which the roof tiles are lifted from the infeed conveyor (1), characterised in that a part (10) of the infeed conveyor (1) or parts of its frame (14) are vertically adjustable in relation to the rising conveyor (3) whereby roof tiles (7) with different profiles may be aligned on the appropriate level in relation to the support shelves (6).

2. Apparatus according to claim 1, characterised in that parts of the frame (14) are individually adjustable for height.

3. Apparatus according to claim 1 or 2, characterised in that parts of the frame (14) can be sideways displaced individually, normal to the tiles' (7) main conveyance direction.

4. Apparatus according to any of the claims 1 - 3, characterised in that respective part of the frame (14) upholds at least one conveyance element (12) such as a conveyor belt or haulage cable, on which tiles (7) are conveyed, and is, by means of control elements (18) and level regulation elements (22, 23) in contact with a foundation (15) common to both the infeed conveyor (1) and the rising conveyor (3).

5. Apparatus according to any of the claims 1 - 4, characterised in that the level regulation elements comprise at least one master cam (22) for respective part of the frame (14) and at least one holding on element (23) arranged in connection with it.

6. Apparatus according to claim 5, characterised in that one or several master cams

(22) are arranged on a rail with restricted guidance in its longitudinal direction (21), in connection with one holding on element (23), arranged for each master cam (22) on respective part of the frame (14), which preferably comprises a wheel.

5  
7. Apparatus according to any of the claims 2 - 6, characterised in that the control elements (18) comprise guides (19), in which the legs (17) arranged for respective parts of the frame (14) are vertically displaceable.

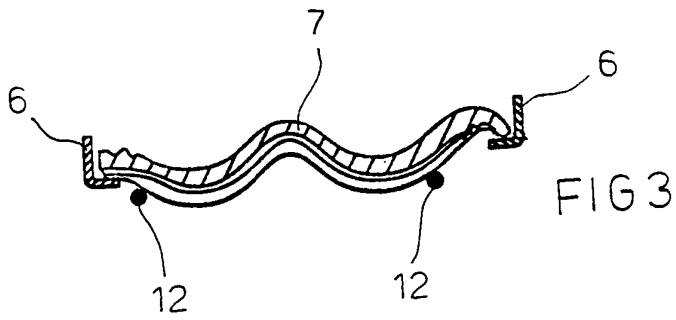
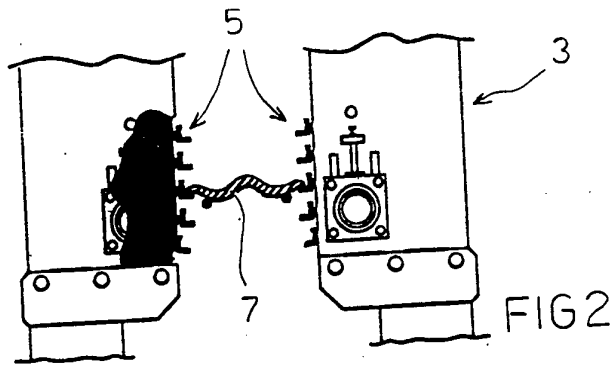
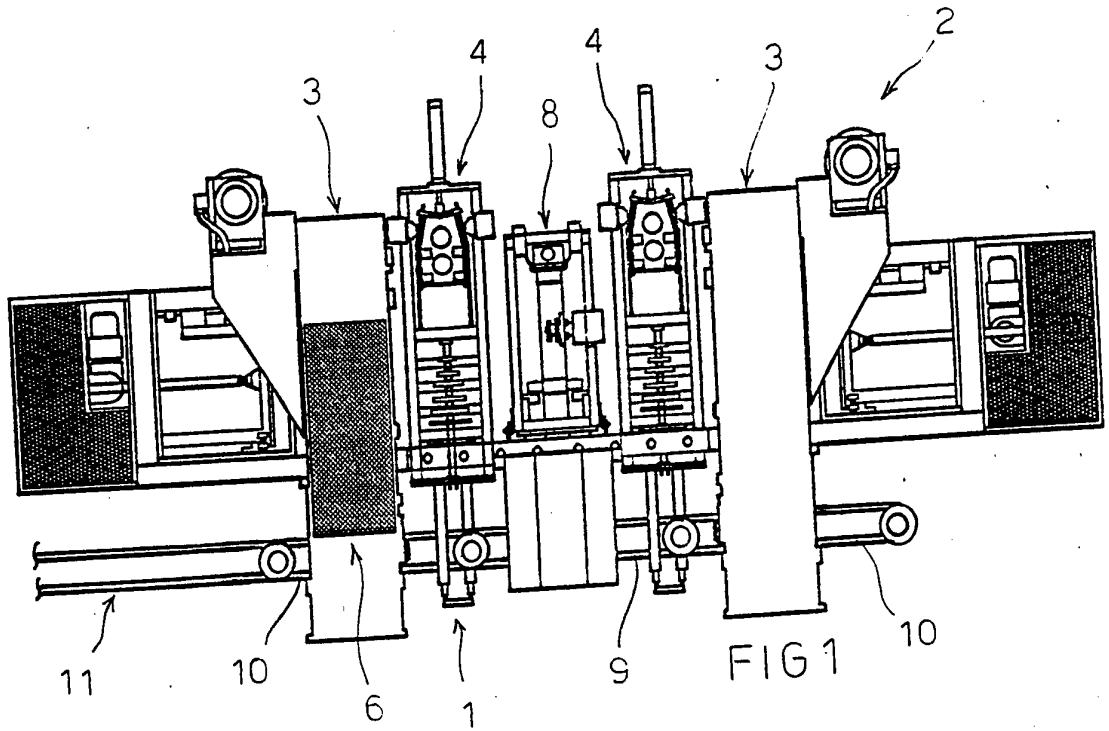
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8. Apparatus according to any of the claims 4 - 7, characterised in that at least two parallel frame parts (14) that uphold conveyance elements (12) are arranged at a distance from each other, alongside the infeed conveyor (1) and by the fact that the very same, endless, conveying element (12) runs through  
15  
respective part of the frame (14) as well as in other parts (9) of the infeed conveyor (1), driven by a driving motor common for all conveyance elements (12) by  
20  
means of a driving wheel connected with the respective conveyance element (12).

9. Apparatus according to any of the claims 1 - 6, characterised in that the conveyance element (12) runs at the same speed in the vertically adjustable part (10) as in other parts (9) of the infeed conveyor.

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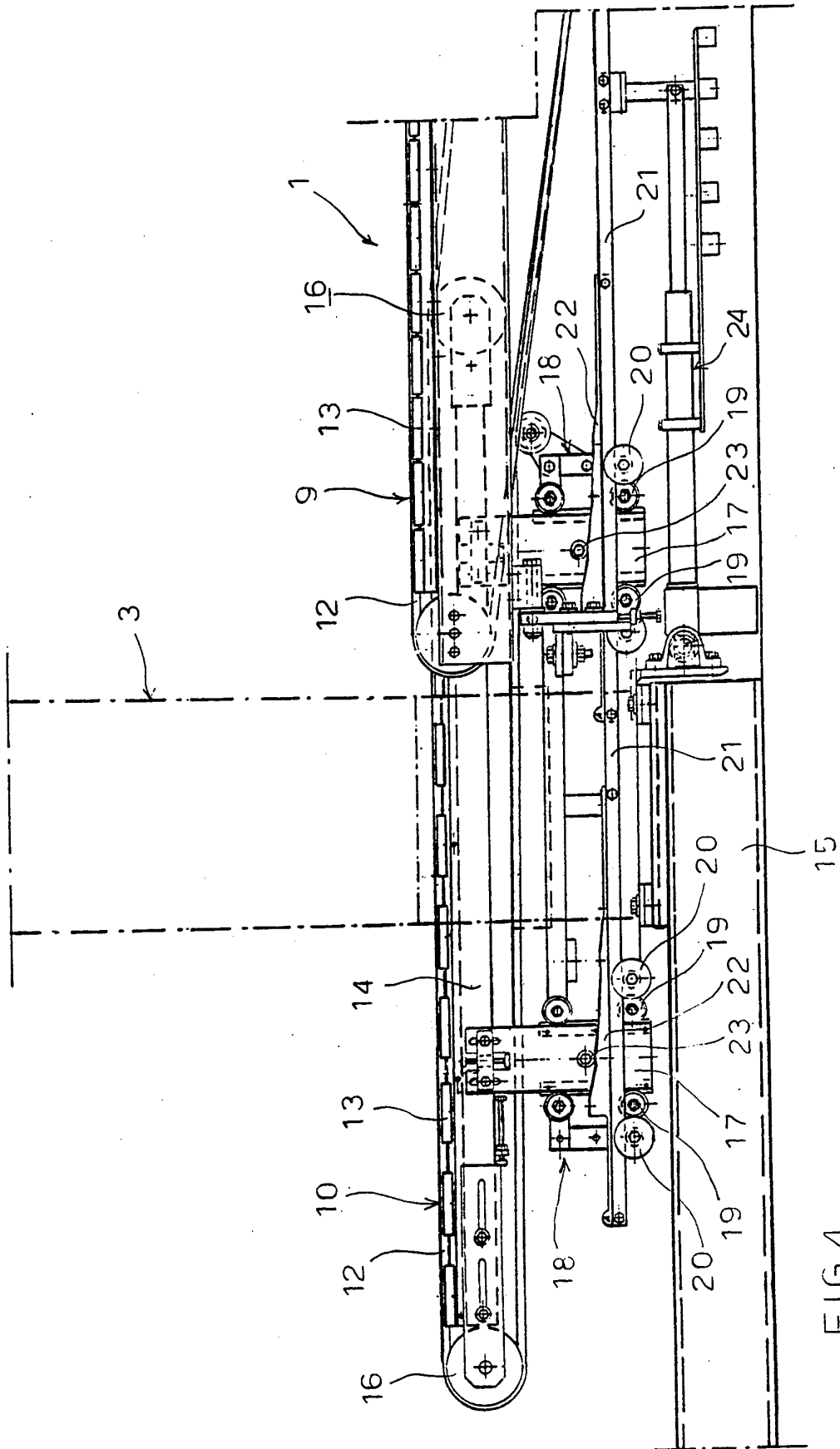


FIG 4

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/01014

## A. CLASSIFICATION OF SUBJECT MATTER

IPC5: B65G 57/14, B65G 57/30

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB, A, 2198106 (REDLAND ROOF TILES LIMITED), 8 June 1988 (08.06.88) --	1-9
A	US, A, 4684308 (WOLFGANG C. DORNER), 4 August 1987 (04.08.87) -- -----	1-9

 Further documents are listed in the continuation of Box C. See patent family annex.

## \* Special categories of cited documents:

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Date of the actual completion of the international search

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**INTERNATIONAL SEARCH REPORT**  
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International application No.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2198106	08/06/88	AU-B- 598320	21/06/90
		AU-A- 8130987	26/05/88
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		SE-T3- 0268438	
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US-A- 4684308	04/08/87	NONE	
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