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• **OIKI ACCIAI INOSSIDABILI S.P.A.**
43100 Parma (IT)

(72) Inventor: **Selmi, Silvio**
4201 Bibbiano, Reggio Emilia (IT)

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(74) Representative: **Mancini, Vincenzo, Dr. et al**
Ing. A. Giambrocco & C. s.r.l.,
Via Rosolino Pilo 19/B
20129 Milano (IT)

(71) Applicants:
• **MATTER S.R.L.**
42020 Quattro Castella, Reggio Emilia (IT)

(54) **Machine for separating a desired number of metal sheets from a master pack**

(57) The machine (10) enables a desired number of metal sheets to be separated from a master pack (20) and comprises a first cradle (12) movable between a horizontal first position, a second position close to vertical, and a vertical third position. The first cradle (12) is provided with a bed (14) and a relative perpendicular side wall (16). The first cradle (12) is also provided with means (44) for moving its bed (14) parallel to itself. A second cradle (24) is movable between a vertical first position, in which it faces the first cradle (12) when in its

third position, and a second position close to vertical. The second cradle (24) is provided with a bed (26) and a relative perpendicular side wall (28). The second cradle (24) is also provided with means (34) for moving its bed (26) parallel to itself. A separator element (38) is insertable between the metal sheets (20) carried by the first cradle (12) when in its second position to separate the desired number (36) thereof from the master pack (20). The separator element (38) also acts as a pusher against the separated metal sheets (36) to move them onto the second cradle (24).

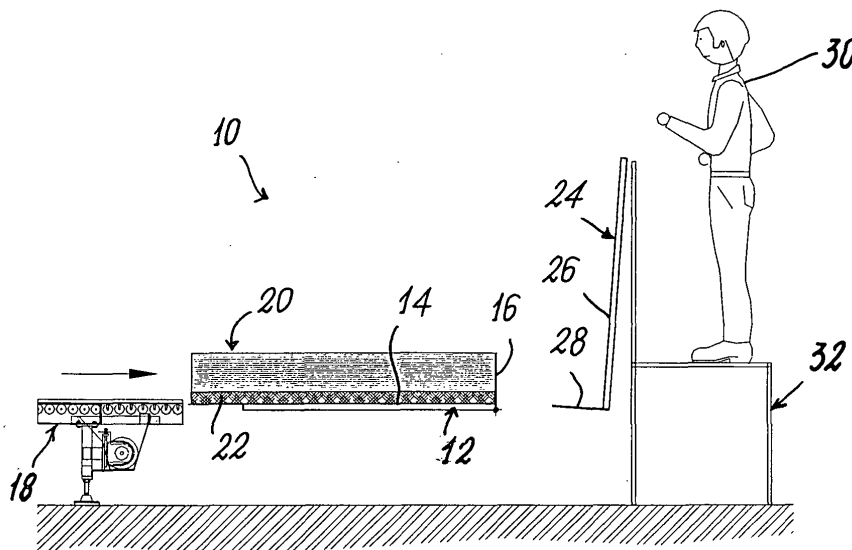


FIG. 1

Description

[0001] The present invention relates to a machine which enables a desired number of metal sheets to be separated from a so-called master pack, in order to form a so-called derivative pack or an assembly of several derivative packs.

[0002] The term "master pack" means a pack of sheets of any metal or alloy, usually separated from each other by a paper sheet, the pack being rested on a relative pallet which facilitates its handling. The term "derivative pack" means a pack which is formed from the metal sheets withdrawn from the master pack and still separated from each other by a paper sheet, and is for example to be despatched to a client. In the assembly formed from several derivative packs, a sheet of plastic material is normally interposed to divide the various derivative packs from each other.

[0003] The operation of separating a determined number of metal sheets from a master pack to form a derivative pack is currently carried out manually, at the most with the aid of suckers or, if the metal sheets are of ferromagnetic material, by means of magnets. In all cases, one metal sheet together with the relative paper sheet is withdrawn at a time from the master pack, in which the metal sheets are disposed horizontal, resting on the relative pallet, to form the derivative pack on another pallet.

[0004] As will be immediately apparent such an operation, besides being lengthy and fatiguing for the personnel concerned, exposes them to the danger of accidents.

[0005] The object of the present invention is to provide a machine which enables the desired number of metal sheets to be withdrawn from a master pack, and form a derivative pack or an assembly of derivative packs with total safety and minimum fatigue for the personnel concerned.

[0006] This object is attained by the machine of the present invention, comprising:

- a first cradle movable between a horizontal first position, a second position close to vertical, and a vertical third position, the first cradle being provided with a bed and a relative perpendicular side wall, the bed being able to receive a master pack together with the relative pallet when the first cradle is in its first position, in the second position of the first cradle the metal sheets of the master pack resting by their edges against the side wall of the first cradle, the first cradle also being provided with means for moving its bed parallel to itself;
- a second cradle movable between a vertical first position, in which it faces the first cradle when in its third position, and a second position close to vertical, the second cradle being provided with a bed and a relative perpendicular side wall, the second cradle being also provided with means for moving

its bed parallel to itself, the free edge of the side wall of the second cradle substantially coinciding with the free edge of the side wall of the first cradle both when both cradles are in their second position and when the first cradle is in its third position and the second cradle is in its first position;

- a separator element insertable between the metal sheets carried by the first cradle when in its second position to separate the desired number thereof from the master pack, the separator element also acting as a pusher against the separated metal sheets to move them onto the second cradle when this is in its second position.

[0007] The invention will be more easily understandable from the following description of one embodiment thereof. In this description reference is made to the accompanying drawings, in which Figures from 1 to 12 show a machine of the present invention in its various stages of operation, the machine illustrated being particularly suitable for receiving master packs formed from metal sheets of dimensions between 2000 x 1000 and 4000 x 1500 millimetres, with a thickness between 0.5 and 8 millimetres, the master pack normally having a weight up to 3000 kg and containing up to 200 metal sheets.

[0008] As can be seen from Figure 1, the machine of the invention, indicated overall by 10, comprises a first cradle 12 which itself comprises a bed 14 movable parallel to itself, and a perpendicular side wall 16. The first cradle 12 is conveniently constructed with a structure formed from steel sections. Neither the bed 14 nor the side wall 16 needs to have a continuous surface, they being able to be in the form for example of a rack or a frame also constructed from steel sections.

[0009] The bed 14 is moved parallel to itself for example by conventional hydraulically operated devices.

[0010] In Figure 1 the machine 10 is shown in its stand-by position in which, by means for example of an automatic conveyor 18 (partly shown in said figure), a master pack of metal sheets 20, provided with its relative pallet 22, is disposed on the bed 14 of the machine 10. For this purpose there can also be provided for example a motorized roller table which extends along the centre of the rack forming the bed 14 when the first cradle 12 lies in its aforesaid first position (i.e. in the horizontal position), with the right side of the master pack 20 resting against the side wall 16 of the first cradle 12. It should be noted that instead of using the conveyor 18, the master pack can be fed to the machine 10 in other ways, for example by a conventional fork lift truck.

[0011] The machine 10 comprises a second cradle 24 also comprising a bed 26 and relative perpendicular side wall 28. The second cradle with its relative bed 26 and side wall 28 can be formed in a similar manner to that already described with regard to the first cradle 12, so that no further description will be given.

[0012] As can be seen from Figure 1, the second cra-

dle 24 lies in the position already described as its second position, in which it has an orientation close to the vertical.

[0013] The machine 10 is also provided with a station 32 for the operator or operators (normally not more than two). In the figure a single operator is shown for simplicity, indicated by 30. This station consists essentially of a raised footboard or gangway on which all the various controls of the machine 10 (not shown for simplicity) are disposed in a manner easily accessible by the operator. These controls are connected to a control unit of micro-processor type, and in particular to a personal computer (not shown in the figures for simplicity).

[0014] When a master pack 20 has been disposed on the bed 14, the operator 30 operates a relative control to cause the control unit to activate corresponding operating means (not shown, but of conventional type, and preferably of hydraulic type) which move the first cradle 12 from its first position (Figure 1) to its second position (Figure 2) in which the master pack 20 has an orientation as close as possible to vertical (in this, taking obvious account of the fact that the metal sheets of the pack 20 must always lie in a safety condition, i.e. without any tendency to accidentally overturn against the bed 26 of the adjacent second cradle 24, which could represent a danger to the operator 30, especially to his hands). The control unit then activates other operating means (indicated schematically by the arrows 34 in Figure 2) to move the bed 26 from its withdrawn position (Figure 1) to its advanced position (Figure 2) in which the lower edge of the bed 14 touches the master pack 20. The operator 30 can now count the number of metal sheets to be separated, making them overturn one or more at a time (according to what is most comfortable) with his hands (this being very simple, in view of the position of the master pack 20), so that the desired number of metal sheets to be separated lie in the condition shown in Figure 3, in which these metal sheets form a derivative pack 36b which rests against the bed 26 of the second cradle 24. The derivative pack 36 however still lies with its edge against the side wall 16 of the first cradle 12. The remaining metal sheets of the master pack are indicated in Figure 3 by 20A. At this point the operator 30 extracts any paper separation sheet lying between the derivative pack 26 and the remainder of the master pack 20A.

[0015] As a result of the intervention of the operator 30, who operates an appropriate control (not shown), the control unit causes a separation element 38 in the form of a wedge (not visible in Figures 1 and 2 because it lies at a height outside the range of said figures) to descend from above (Figure 3). This wedge 38 can be conveniently suspended on steel cables (not shown), so that it can be easily raised and lowered by a conventional hoist. The wedge 38 is conveniently covered with a suitable material to prevent damage to the metal sheets with which it comes into contact. The wedge 38 must be lowered in such a manner that it becomes inserted between the remainder 20A of the master pack and the

derivative pack 36 which has just been formed, the wedge 38, if of sufficient weight, attaining the position indicated by 38A in Figure 3 by gravity. At this point, either by intervention of the operator 30 or as a result of a signal from an appropriate sensor which informs the control unit that the wedge 38 has reached the required lower position, the control unit causes the wedge 38, which extends at its two sides beyond the metal sheets, to be engaged by pusher means (not shown for simplicity, but of conventional type), conveniently of hydraulic operation, which exert on the wedge 38 a horizontal thrust in the direction of the second cradle 24. Simultaneously the control unit inactivates the operating means 34, so that the relative bed 26, under the thrust of the wedge 38, withdraws together with the derivative pack 36, until appropriate sensors (not shown) with which the machine 10 is provided (for example photosensors) sense that the entire derivative pack 36 has been transferred beyond the horizontal line 40 forming the boundary line between the side wall 16 of the first cradle 12 and the side wall 28 of the second cradle 24. At this point the control unit causes the separation wedge 38 to rise, so that it is no longer visible in Figure 5. This figure shows the next stage, in which the first cradle 12 has been made to return by the control unit into its first position (horizontal). It is therefore possible to remove the remainder 20A of the master pack and hence be able, if required, to place on the bed 14 another master pack composed of metal sheets of dimensions or material different from the preceding.

[0016] We will assume for simplicity that the new master pack is that indicated in Figure 5 by 20A, and in particular an incomplete master pack from which a determined number of metal sheets have already been removed (there is obviously no difference if the new master pack is complete), so that its upper face is moved to the level of the upper edge of the side wall 16. On command by the operator 30, the control unit returns the first cradle 12 from its first position (Figure 5) to its second position (Figure 6). In the meantime the operator 30 will have preferably placed on the free face of the derivative pack 36, already present on the second cradle 24, a sheet (normally of plastic material) which conveniently serves to divide the first derivative pack 36 from the new derivative pack which is to be formed and will be composed of a different type of metal sheet. At this point the aforesaid operations are repeated, i.e. manual separation by the operator 30 of a certain number of metal sheets from the second master pack, which will be rested against the free side (possibly covered by the aforesaid plastic separation sheet) of the first derivative pack 36, and will form the second derivative pack.

[0017] At this point, preferably on command by the operator (however the control unit could do this directly, in which case the machine 10 would have to be provided with a sensor which informs the control unit that the first cradle 12 has returned to its second position) the insertion operation for the separation wedge 38 is repeated

as far as the position indicated by 38A in Figure 6, as is the operation involving the forced movement of the wedge towards the first derivative pack, with simultaneous withdrawal of the bed 14 from the second cradle 24 (Figure 7), so as to accumulate on this latter the assembly of two derivative packs, this assembly being indicated in Figure 6 by 36A, whereas the remainder of the second master pack is indicated by 20B.

[0018] Figure 8 describes the next stage, in which the first cradle 12, with the remainder 20B of the second master pack, is returned to its initial position.

[0019] At this point it is apparent that the same operation can be repeated with a third master pack, and so on, to finally obtain on the second cradle 24 an assembly formed from the required number of derivative packs (separated from each other preferably by a plastic sheet), each formed of the desired number of metal sheets of the required type (in accordance with the requirements of a determined client), the maximum number of derivative packs and/or of metal sheets for each derivative pack being determined only by the capacity of the second cradle 24.

[0020] Finally, having obtained the required assembly 36A of derivative packs, and after removing the remainder of the last master pack from the first cradle 12, a conventional pallet or in the limit simple flat planking, indicated in Figure 9 by 42, is disposed on the bed 14 of the first cradle 12. At this point, either automatically or by the intervention of the operator 30, the control unit activates operating means (indicated schematically in Figure 9 by the arrows 44, preferably of hydraulic type) which enable the upper edge of the pallet 42 to be moved to the level of the upper edge of the side wall 16, the first cradle 12 then being brought into that position defined hereinbefore as its third position (vertical). At the same time the second cradle 24 is also brought into that position defined hereinbefore as its first position (also vertical), by which the situation of Figure 10 is obtained. At this point, either by intervention of the operator operating an appropriate control, or automatically (if the control unit is provided with suitable sensors which inform it when the vertical position of both cradles 12 and 24 has been attained), the control unit activates the operating means 34 of the bed 26 so that the assembly of derivative packs 36A, including the pallet 42, is moved from the second cradle 24 to the first cradle 12, as shown in Figure 11.

[0021] Having done this, again by the intervention of the operator 30 or automatically (if sensors are provided to inform the control unit when this situation has been attained), the control unit returns the first cradle 12 to its first position, so that the assembly 36A of derivative packs can be removed, to hence conclude the scheduled cycle. The machine 10 is now ready to effect a new cycle.

[0022] The machine 10 can conveniently be provided with conventional load cells which enable the weight of the formed derivative packs to be determined, either by

difference or by addition.

[0023] It should be noted that the machine of the present invention can be conveniently used in all those concerns which process sheets of any metal or alloy, or in which a client has to be supplied with assemblies formed from a determined number of metal sheets per type. It is immediately apparent that the machine of the present invention enables a considerable time and cost saving to be obtained, in addition to substantially eliminating the risk of accidents to the personnel concerned.

Claims

1. A machine for separating a desired number of metal sheets from a master pack, in order to form a derivative pack or an assembly of derivative packs, comprising:
 - a first cradle (12) movable between a horizontal first position, a second position close to vertical, and a vertical third position, the first cradle (12) being provided with a bed (14) and a relative perpendicular side wall (16), the bed (14) being able to receive a master pack (20) together with the relative pallet when the first cradle (12) is in its first position, in the second position of the first cradle (12) the metal sheets of the master pack (20) resting by their edges against the side wall (16) of the first cradle (12), the first cradle (12) also being provided with means (44) for moving its bed (14) parallel to itself;
 - a second cradle (24) movable between a vertical first position, in which it faces the first cradle (12) when in its third position, and a second position close to vertical, the second cradle (24) being provided with a bed (26) and a relative perpendicular side wall (28), the second cradle (24) being also provided with means (34) for moving its bed (26) parallel to itself, the free edge of the side wall (28) of the second cradle (24) substantially coinciding with the free edge of the side wall (16) of the first cradle (12) both when both cradles (12, 24) are in their second position and when the first cradle (12) is in its third position and the second cradle (24) is in its first position;
 - a separator element (38) insertable between the metal sheets (20) carried by the first cradle (12) when in its second position to separate the desired number (36) thereof from the master pack (20), the separator element (38) also acting as a pusher element against the separated metal sheets (36) to move them onto the second cradle (24) when this is in its second position.
2. A machine (10) as claimed in claim 1, wherein an

operation control unit for the machine (10) is provided.

3. A machine (10) as claimed in claim 2, wherein the control unit is of microprocessor type. 5
4. A machine (10) as claimed in claim 1, wherein hydraulic means are provided for moving the first cradle (12) and the second cradle (24) into their various positions, for moving parallel to itself both the bed (14) of the first cradle (12) and the bed (26) of the second cradle (24), and for operating the separator element (38) as a pusher. 10
5. A machine (10) as claimed in claim 1, wherein a hoist is provided for raising and lowering the separator element (38), the separator element (38) being in the form of a wedge of adequate weight. 15

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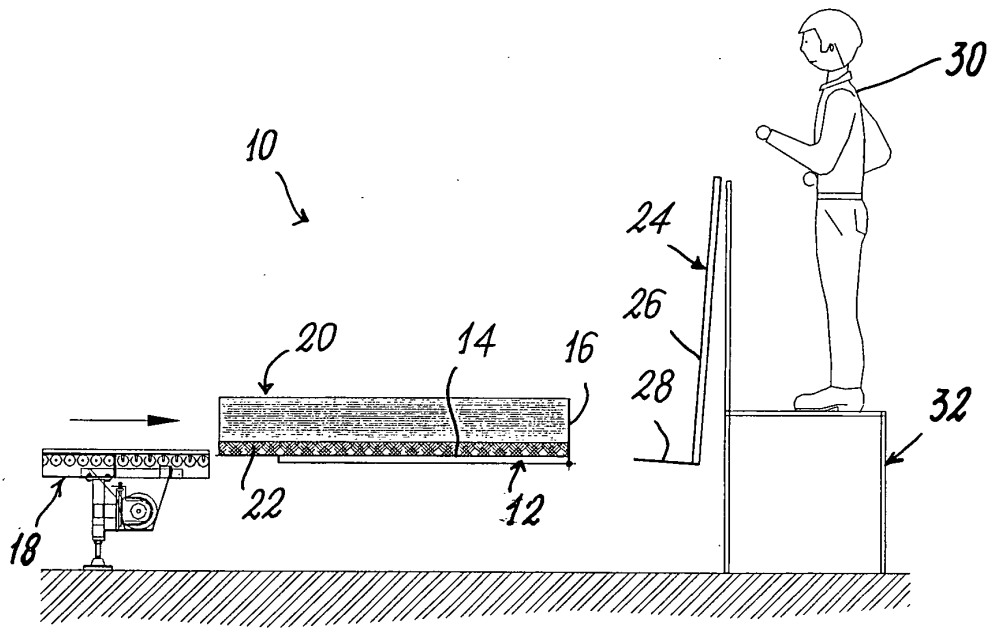


FIG. 1

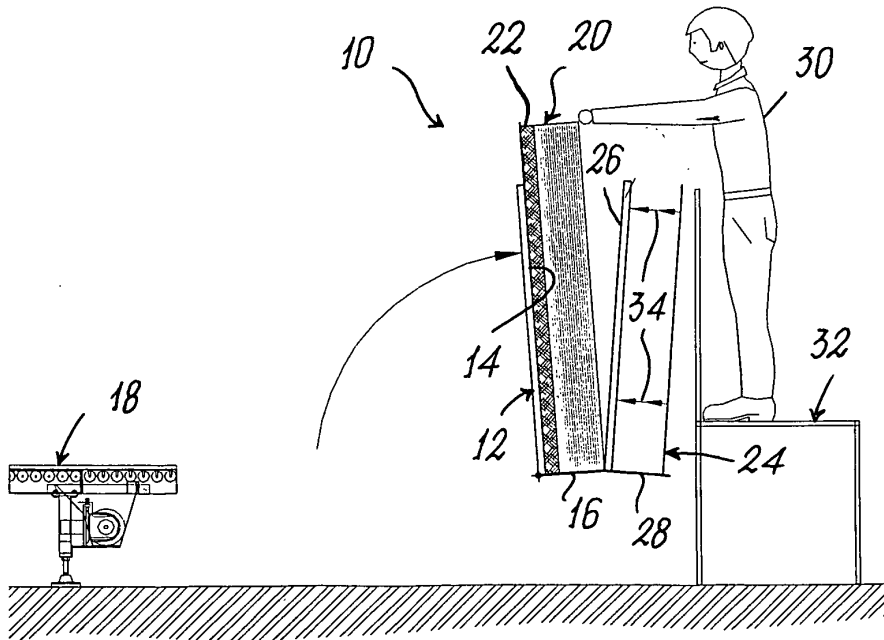


FIG. 2

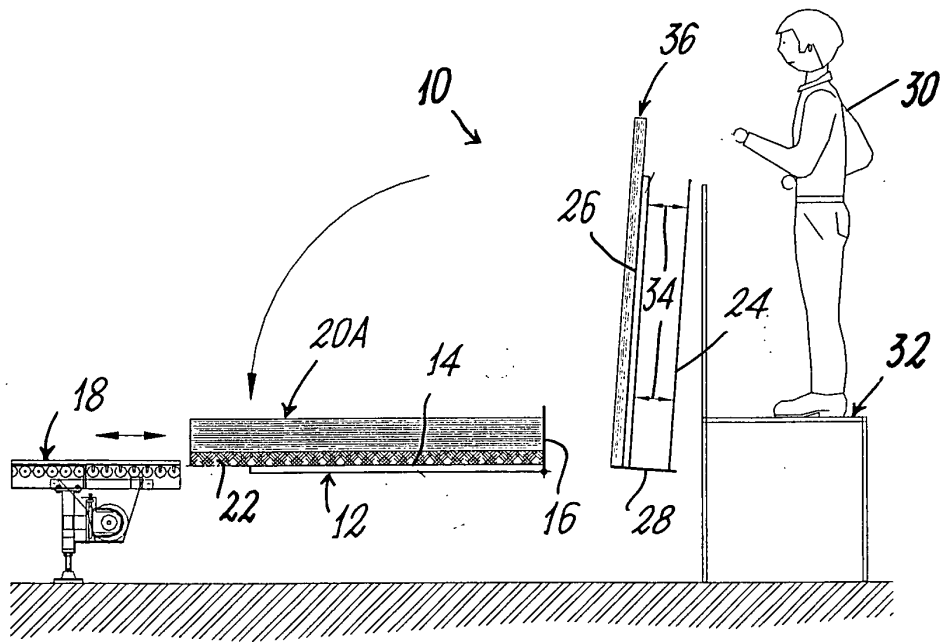


FIG. 5

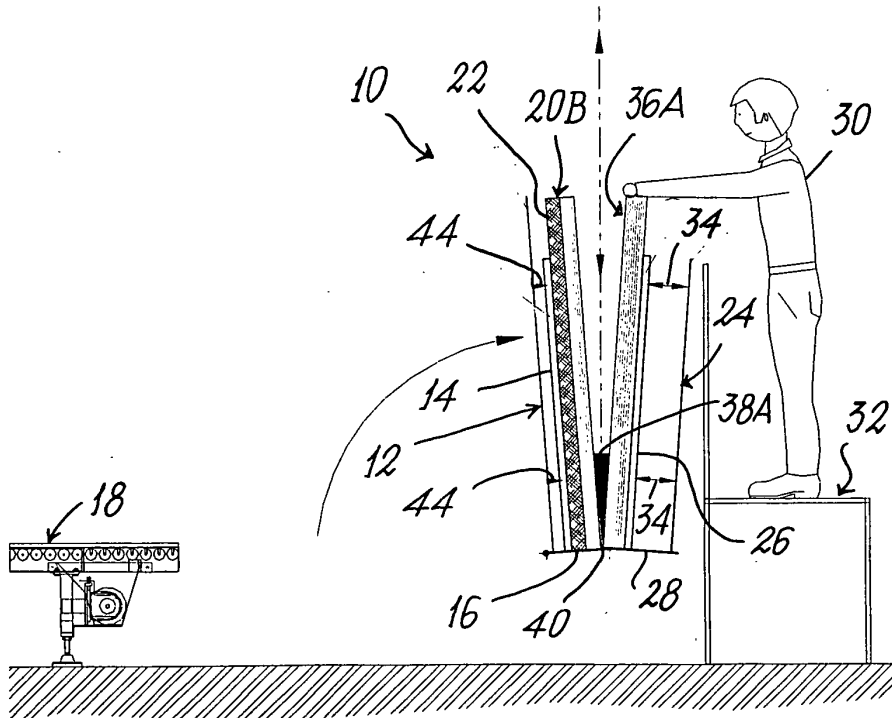


FIG. 6

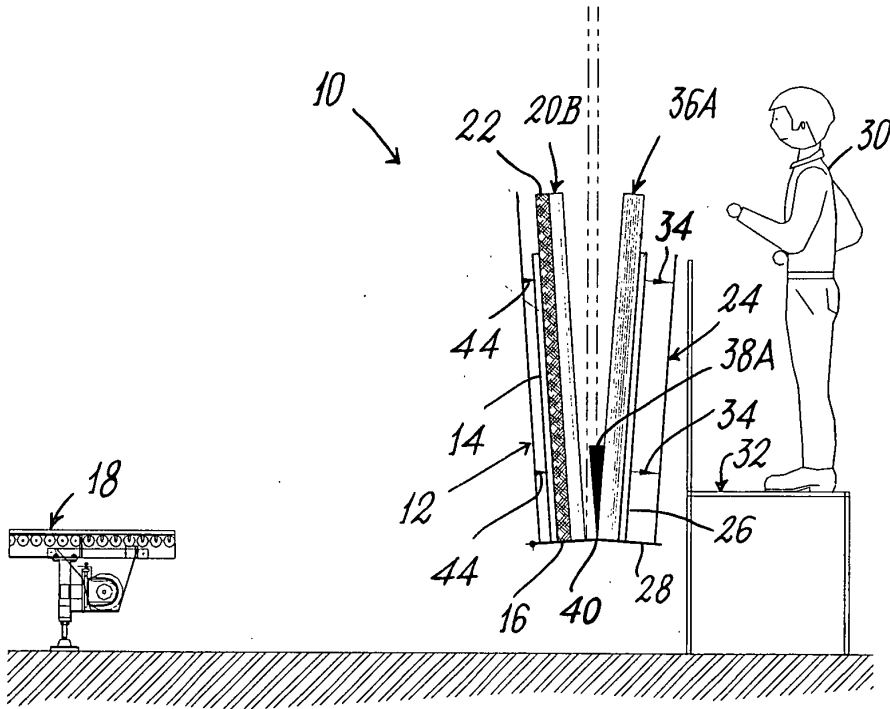


FIG. 7

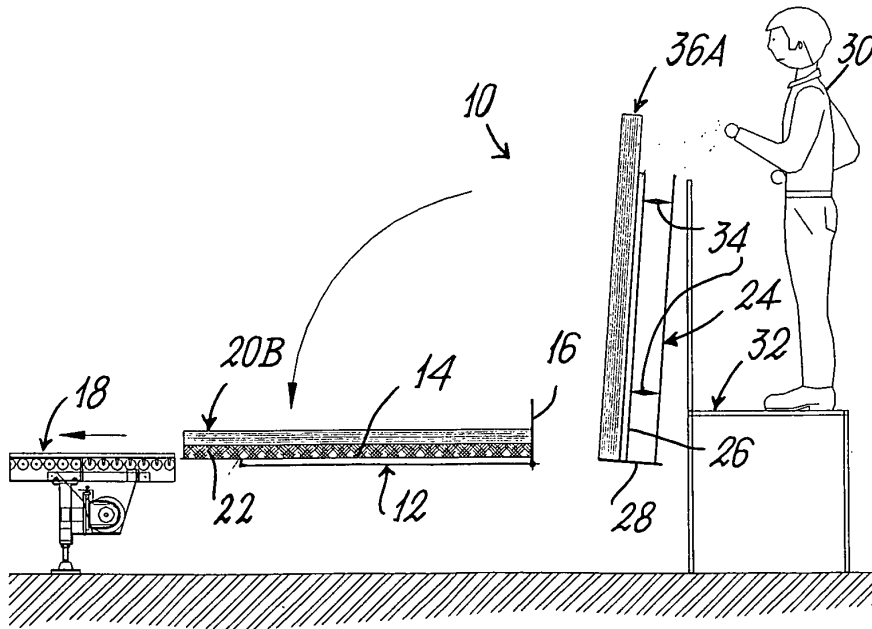


FIG. 8

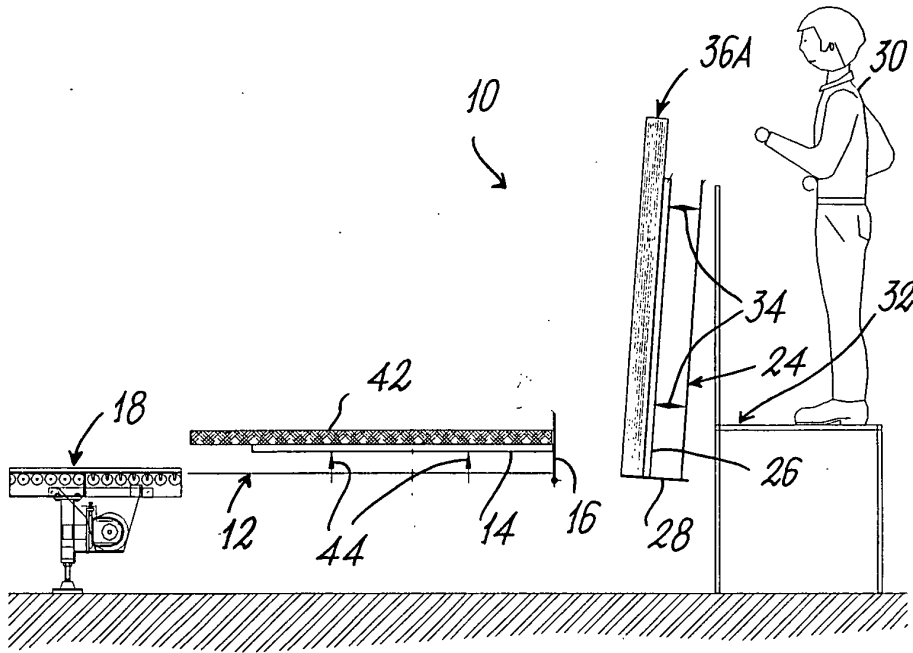


FIG. 9

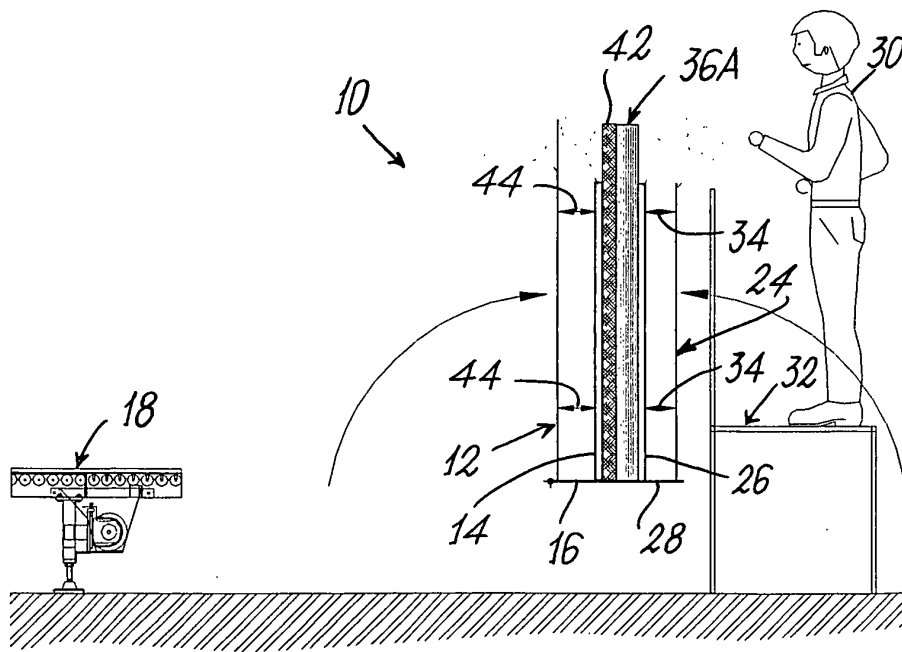


FIG. 10

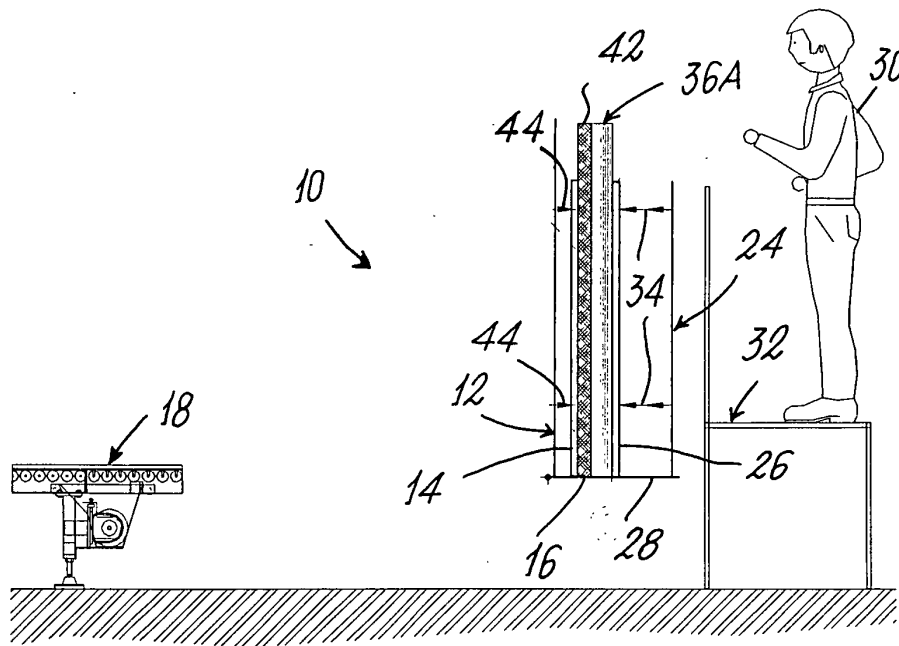


FIG. 11

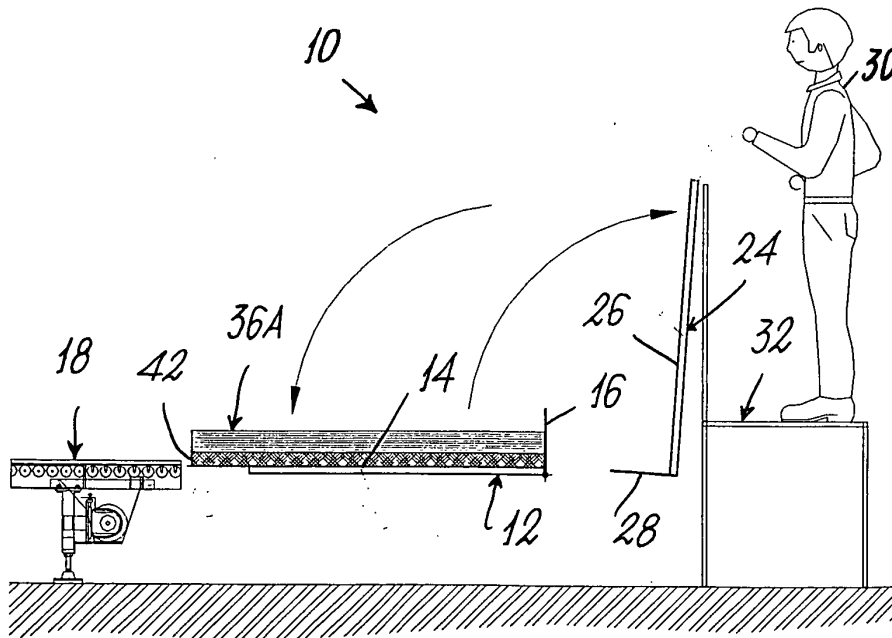


FIG. 12



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EUROPEAN SEARCH REPORT

Application Number
EP 02 01 7133

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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65H B65G
Place of search	Date of completion of the search	Examiner	
THE HAGUE	15 November 2002	Papatheofrastou, M	
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