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(54) **A device for forming an orderly stack of articles and for discharging the said stack into a corresponding container.**

(57) The device comprises a station for forming a layer of articles (4), provided with movable means for supporting and guiding the articles (4) and for releasing the layer downwards.

Placed underneath the station there is a support plate movable between two positions, namely an upper position and a lower position. Above the station a presser, movable vertically, is provided and this, in the downward travel, first of all releases the layer from the movable means and then pushes the layer deposited on the plate and the plate itself, downwards.

Through a succession of layers from the top downwards, a stack (P) is formed.

At one side of the formed stack (P) there is a tubular guide member (21), and at the other, pusher means (27).

Because of the synchronous movement of the guide member (21) and the pusher means (27) towards the station (R) for the filling of the container (33), the said guide member (21) is caused to be inserted partially into the container (33), and the stack (P) to be subsequently placed in the said container (33).

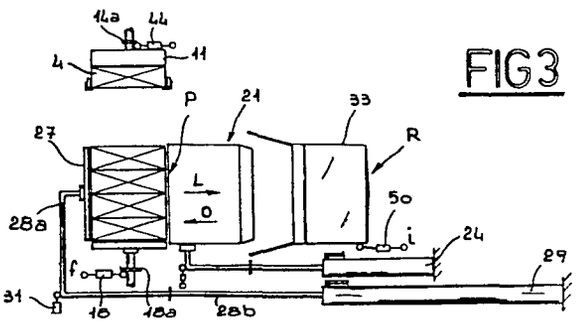

FIG3

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A device for forming an orderly stack of articles and for discharging the said stack into a corresponding container

The invention relates to a device for forming an orderly stack of articles and for discharging the said stack into a corresponding container.

Apparatus destined to transform blanks into corresponding containers of parallelepiped shape is known which, first of all, transforms the blank into a corresponding tubular element of rectangular section, and then attends to the folding of the flaps that define the base of the container. At this point, the container is transferred to a suitable charging station at which the open extremity of the said container is coupled with the extremity shaped to receive it , of a tubular guide member (more precisely, the latter is inserted in the former). At this juncture, pusher means insert, first of all into the tubular guide member, and then into the container, an orderly stack of pre-established articles. The cycle is completed with the disengagement of the container, filled in the way stated above, from the aforementioned tubular guide member, and with the subsequent action of the folding means destined to fold the flaps that define the cover of the container. The container, thus formed, is sent on towards a banding group that looks after the locking, one to the other, of the flaps in the base and in the cover of the container. The said stack is achieved by stratifying in succession a number of layers that are identical one with the other and are fashioned individually at a forming station.

The said station is provided with two parallel guides, destined to support the articles in the layer under formation, and two vertical, longitudinal, walls that co-operate with the said guides in the formation of one layer.

Placed above the said walls are means of support that rotate outwards (if stressed by a force directed from the bottom upwards) in contrast with corresponding elastic means, the purpose of this being to allow a layer of articles raised by a lifting device (actuated by sensor means that detect the formed layer) positioned, when not in operation, underneath the guides, to transit there inbetween.

Just as soon as a layer has passed between the said support means, the layer (because of the subsequent downward travel of the lifting device) is deposited on the support means (which are returned to the closed position) and thus, through a succession of layers from the bottom upwards, the said stack is created. As already seen, the pusher means come into operation when the stack has been completed.

Since the height of the stack, the overall height of the support means and of the lateral wall, and the partial extension in height of the jack that powers the lifting device are greater than the overall height of the associated apparatus that transforms the blanks into corresponding containers of parallelepiped shape, this adversely affects the total space taken up by the apparatus complete with the device described herein for the formation of the said stack.

The provision of the fixed tubular guide member causes two main problems, the first of which is the need to provide, in the associated apparatus, means destined to move the container in order to couple the open extremity of this with the mouth of the said tubular member, and the second, that during the charging of the stack into the container, the former tends to get out of shape because of the long way it has to go and, furthermore, because of it having to pass, first of all, into the tubular mem-

ber and then into the container concerned.

The upper layer of the stack under formation generally has an effect exerted on it by a presser whose function is to stabilize the stack at the time the subsequent layers thereof are being formed. The presence of the presser pinpoints one problem connected with the foregoing technical solution: a layer inserted at the bottom of the stack under formation is, in fact, compressed by the layers overhead and the latter are, in turn, compressed because, essentially, of the fact that the resisting action of the presser has to be counteracted. With a similar modus operandi it is obviously not possible to stack articles that cannot in any way stand being crushed.

The object of the invention is to make available a device able to form the stack in a succession of layers from the top downwards and, furthermore, able to effect the charging of the stack into the container concerned without the latter having to undergo any kind of displacement.

Another object of the invention is to make available the said device so shaped as not to cause the stack under formation to be harmfully crushed and it not to get out of shape at the time the forming and charging operations are being carried out.

A further object of the invention is to make available the said device constructed in such a way as to limit considerably the overall volume thereof, without this being to the detriment of the functional and productive qualities of the said device.

These objects are all attained with the device according to the invention for forming an orderly stack of articles

and for discharging the said stack into a corresponding container, of the type comprising conveyor means for infeeding identically oriented articles towards a station for forming a layer of identically oriented articles, side by side, and comprising, furthermore, sensor means for detecting a complete layer formed at the said station; the said device being characterized in that it comprises: movable means, belonging to the said station, that adopt two extreme configurations, namely, one for supporting and guiding the articles in the layer under formation, and one for releasing the said layer because of the application of a predetermined force on the said means, directed from the top downwards; a support plate, positioned beneath the said movable means, movable vertically between an upper extreme and a lower extreme position, a distance away one from the other that is a multiple of the height of one layer, the upper position being immediately underneath the said movable means, and the lower position coplanar with the base of a container filling station provided in an apparatus used with the said device, the said plate being destined to accept, intermittently, the layers formed at the said forming station; at least one presser, movable in a reciprocating fashion vertically between two extreme cyclic positions, namely a non-operative position and an operative position, an adjustable distance away one from the other, the non-operative position being above the layer under formation, and the operative position beneath the resting base defined by the said movable means in the configuration in which they support and guide the articles, the said presser being actuated by first powering means subjected to the consent of the said sensor means for detecting one complete layer, and rendered non-operative by the first sensor means for detecting the lower position of the said support plate; a tubular guide member of rectangular section, placed between the said support plate and

the container filling station, the lower wall of which is coplanar with the base of the said filling station and the section of which is no less than the vertical section of the stack of articles supported by the said plate when the latter is in the lower position, the said member being movable horizontally between two extreme positions, namely, a non-operative position and one in which it is partially inserted in the said container; pusher means, movable horizontally, coaxially to the said guide member, between an extreme non-operative position, at the side of the said plate on the opposite side to the said tubular guide member, and an extreme position for inserting the said stack of articles into the said container; second means for powering the said tubular guide member, subjected, for travelling from the non-operative position to that of partial insertion of the said member in the container, to the consent of first sensor means and second sensor means for detecting the container in the filling station, and for the reverse travel, to third sensor means for detecting the insertion position of the said pusher means; third means for powering the said pusher means, subjected, for travelling from the non-operative position to that of insertion of the said pusher means, to the said first and second sensor means, and to fourth sensor means for detecting the absence in the non-operative position of the said tubular guide member; and fourth means for powering the said support plate, subjected, for the return upward travel of the said plate, to fifth sensor means for detecting the non-operative position of the said pusher means.

The stack of articles, achieved by stratifying a number of layers in succession from the top downwards, is positioned beneath the layer forming station. This fact makes it possible to position the relevant container at an iden-

tical height and thereby to limit favourably the overall volume in height taken up by the device described herein and by the associated apparatus for transforming blanks into corresponding containers of parallelepiped shape.

The fact of having envisaged the tubular guide member being movable facilitates the insertion of the stack into the container and, what is of considerable importance, does not require the said container to undergo any kind of displacement.

Emphasis is given to the characteristics of the invention in the description that follows, with reference to the accompanying tables of drawings, in which:

Figure 1 is a front diagrammatic view of the device in question;
Figures 2 and 3 are two lateral diagrammatic views of the device in two successive phases in the formation of a stack of articles;
Figures 4 and 5 are two lateral views of the device in two successive phases pertaining to the charging of the stack into the corresponding container;
Figures 6 and 7 show, in an enlarged scale, two characteristic configurations of the detail A in Fig. 2.

With reference to the above mentioned figures, at 2 there is a conveyor belt (of a known type) destined to transport and orientate (with the aid of suitable locator means 3) articles of parallelepiped shape, to the mouth of a station 1 for forming layers 5 out of the said identically oriented and side by side articles.

The said station is constituted by a pair of vertical, opposite, walls 6, parallel to the direction F in which

the conveyor belt 2 moves forward. To the lower part of each wall 6 is pivotally connected at 9, an angular element 7 subjected to elastic means, shown at 10 (see Figures 6 and 7), which maintain the limb 7a of the element 7 flush up against the lower surface of the corresponding wall 6. It thus ensues that, in the absence of external disturbing causes, the limb 7a is positioned horizontally. The extension of the said limb 7a is such that the extremity thereof projects, with respect to the wall 6, towards the inside of the station 1.

The strips S defined by the two parts of the limbs 7a (relevant to the two walls 6) protruding as stated above, constitute the support and the guide for the articles 4 of the layer 5 under formation at the station 1.

The angular elements 7 turn in counter-rotating directions, N_1 and N_2, respectively, when a thrust directed from the top downwards is applied to the strips S. This is of particular importance, as will be seen below.

Placed above the layer 5 under formation at the station 1 there is a presser 11 carried by the rod 12 of a pneumatic jack 13. The said presser is movable vertically, in a reciprocating fashion, from an upper extreme position (shown in Figure 1) to a lower extreme position. The distance the said positions are apart can be adjusted by varying the position, one with respect to the other, of two projections 14a and 14b for tripping a microswitch 44. The said jack 13 is connected, via tubes C and D, to a first electro-pneumatic control device 14, to which is also connected the terminal h of the aforementioned microswitch 44. The commencement of one elementary cycle of the presser 11 (that is to say, the downward travel of the presser) is subjected to the consent of a microswitch 35

(whose terminal g is connected to the said control device 14), the function of which is to detect the formation of a layer 5 at the station 1.

Underneath the elements 7 there is a support plate 15 that is carried by a rod 16 of a jack 17, the latter being connected, via tubes 17a and 17b, to a second electro-pneumatic control device, shown globally at 20. The plate 15 is movable vertically from an upper extreme position (shown in Figure 1 and defined by a projection 19a tripping a microswitch 19) to a lower extreme extreme position (the one shown in Figures 3, 4 and 5, defined by a projection 18a tripping a microswitch 18). The terminals e and f belonging to the microswitches 19 and 18 are naturally connected to the device 20 and to the device 14.

The particular conformation of the jack 17 and of the electro-pneumatic control device 20 is such as to place the plate 15 in any position between the said upper and lower extreme positions solely to suit the height h of the layer 5, as will be seen hereinafter. The originality of the technical solution used to achieve the foregoing has been defended in a corresponding Patent Application deposited this same day by the same Applicant as herein.

Let it now be supposed that the plate 15 is in its upper extreme position (Figure 1): When the microswitch 35 detects the formation of a layer 5 at the station 1, because of what has been stated above the presser 11 is carried from its upper to its lower extreme position. As the presser moves downwards, it intercepts the layer 5 positioned at the station 1. The consequent impact of the presser with the layer causes a thrust directed from the top downwards to be applied to the strips S of the elements 7 , and this causes the latter to rotate outwards

and to be carried into the configuration shown in Figure 7. The no longer supported layer 5 drops on to the plate 15 below (making a jump of a few millimetres). The layer 5 positioned on the plate 15 is, at the top, subjected to the action of the presser 11, and this causes the plate 15 to move downwards from elevation H to the elevation H_1=H=h. In the said position, the presser 11 has gone past the plane defined by the strips S with the latter in the position shown in Figure 6. The upward bent edge of the presser 11 stabilizes the configuration, shown in Figure 7, of the element 7. The subsequent return upwards of the presser carries the element 7 back into the configuration shown in Figure 6, which permits the formation of a fresh layer 5 of articles to be commenced at the station 1.

This procedure continues until, through a succession of layers, a stack P of articles 1 has been formed on the plate 15. The formation of the stack ceases because of the projection 18a tripping the microswitch 18, the electrical signal sent by the latter to the control device 14 causing the jack 13 to be taken out of operation. The plate 15 is, in its lower extreme position, coplanar with the base 30 of a station R for filling the containers 33. The said station R is provided with a non-illustrated apparatus associated to the device described herein.

A tubular guide member 21 of rectangular section is placed between the plate 15 and the station R. The lower wall of the said member 21 is coplanar with the base 30 of the station R. The section of the member 21 is slightly greater than the vertical section of the stack P and, furthermore, the extremity 22 of the said member is shaped appropriately, as can be clearly seen in Figures 2, 3, 4 and 5. The member 21 is movable horizontally between an extreme non-operative position (see Figures 2 and 3) and a

position in which it is partially inserted in a container 33 positioned at the station R (see Figures 4 and 5). The powering of the member 21 is achieved through a rod 23 of a pneumatic jack 24, the latter being connected, via tubes 24a, to the said control device 14. The said extreme positions of non-operation and of partial insertion are defined by the actuation of corresponding microswitches 25 and 26 connected to the rod 23. The terminals a and b of the said microswitches are connected to the control device 14. Beside the plate 15, on the opposite side with respect to the member 21, a pusher plate 27 is provided and this is coaxial to the member 21. The section of the plate 27 is slightly less than that of the member 21. The plate 27 is carried by an arm 28a integral with a rod 28b of a pneumatic jack 29, the latter being connected, via corresponding tubes 29a, to the control device 14. The jack 29 renders the plate 27 movable horizontally and it displaces it between two extreme positions, namely a non-operative position (shown in Figures 2 and 3) and a position of inserting the stack P into the container 33. The said positions are defined by the projections with which the rod 28b is provided tripping the microswitches 31 and 32, respectively. The terminals c and d of the microswitches 31 and 32 are connected to the control device 14. Furthermore, the terminal c of the microswitch 31 is connected to the said second control device 20.

As described above, the formation of the stack P has been completed once the plate 15 arrives at its lower extreme position. The said situation is "detected" by the electrical signal sent by the microswitch 18 to the control device 14. Furthermore, the said control device 14 also receives the consent signal of a microswitch 50 (the terminal i of which is also connected to the said control device 14) for detecting the presence at the station R of a

container 33. With the consent of both the microswitches 18 and 50, the control device 14 sets in motion the jacks 24 and 29, the purpose of this being to provide the corresponding member 21 and plate 27 with a synchronous traversing movement in the direction L, which causes the stack P to move in harmony because of the thrust action exerted thereupon by the plate 27. Moving in the direction L, the member 21 is inserted partially into the container 33, or rather, the extremity 22 thereof is. The said partial insertion ceases when the said microswitch 26 is tripped, though the said member 21 stays in the said position of partial insertion since the movement of the relevant rod 23 in the direction C, namely the opposite direction to L, is dependent upon the consent of the microswitch 32.

The traversing movement of the plate 27 in the direction L carries the stack P to pass, first of all, into the member 21 and then, with the aid of the extremity 22 thereof, into the open extremity 33a of the container 33. The traversing movement of the plate 27 in the direction L ceases once the rod 28b trips the microswitch 32; in the said situation, the stack P is positioned completely in the inside of the container 33.

With the tripping of the microswitch 32, the control device 14 sets in motion the jacks 24 and 29 in order to provide the corresponding member 21 and plate 27 with traversing movement in the said direction O. The tripping of the microswitch 31 allows the control device 20 to control the jack 17 in such a way as to carry the plate 15 into the upper extreme position. The tripping of the microswitch 19 gives consent to the operation of the jack 13, and it is thus possible to commence a fresh cycle, identical to the previous one, for the formation of a stack P

and the discharge of the said stack into a corresponding container 33.

It is understood that the foregoing description has been given purely as an unlimited example and thus that consideration may be given to modifications of the constructional details of the device without, in any way, deviating from the technical solution as described above and claimed below.

Claims:

1. A device for forming an orderly stack of articles and for discharging the said stack into a corresponding container, of the type comprising conveyor means for infeeding identically oriented articles towards a station for forming a layer of identically oriented articles, side by side, and comprising, furthermore, sensor means for detecting a complete layer formed at the said station; the said device being characterized in that it comprises: movable means 7, belonging to the said station 1, that adopt two extreme configurations, namely, one for supporting and guiding the articles 4 in the layer 5 under formation, and one for releasing the said layer 5 because of the application of a predetermined force on the said means 7, directed from the top downwards; a support plate 15, positioned beneath the said movable means 7, movable vertically between an upper extreme and a lower extreme position, a distance H_1 away one from the other that is a multiple of the height h of the said layer 5, the upper position being immediately underneath the said movable means 7, and the lower position coplanar with the base 30 of a filling station R for a container 33 provided in an apparatus used with the said device, the said plate 15 being destined to accept, intermittently, the layers 5 formed at the said forming station 1; at least one presser 11, movable in a reciprocating fashion vertically between two extreme cyclic positions, namely a non-operative position and an operative position, an adjustable distance away one from the other, the non-operative position being above the layer 5 under formation, and the operative position beneath the resting base defined by the said movable means 7 in the configuration in which they support and guide the articles 4, the said presser 11 being actuated by first powering means 12 and 13 subjected to the consent of the said sensor means

35 for detecting one complete layer 5, and rendered non operative by first sensor means 18 for detecting the lower position of the said support plate 15; a tubular guide member 21 of rectangular section, placed between the said support plate 15 and the filling station R for the container 33, the lower wall of which is coplanar with the base of the said filling station and the section of which is no less than the vertical section of the stack P of articles 4 supported by the said plate 15 when the latter is in the lower position, the said member 21 being movable horizontally between two extreme positions, namely, a non-operative position and one in which it is partially inserted in the said container 33; pusher means 27, movable horizontally, coaxially to the said guide member 21, between an extreme non-operative position, at the side of the said plate 15 on the opposite side to the tubular guide member 21, and an extreme position of inserting the said stack P of articles 4 into the said container 33; second means 23 and 24 for powering the said tubular guide member 21, subjected, for travelling from the non-operative position to that of partial insertion of the said member 21 in the container 33, to the consent of first sensor means 18 and second sensor means 50 for detecting the container 33 in the filling station R, and for the reverse travel, to third sensor means 32 for detecting the insertion position of the said pusher means 27; third means 28a, 28b and 29 for powering the said pusher means 27, subjected, for travelling from the non-operative position to that of insertion of the said pusher means, to the said first and second sensor means 18 and 50, and to fourth sensor means 25 for detecting the absence in the non-operative position of the said tubular guide member 21; and fourth means 16 and 17 for powering the said support plate 15 , subjected, for the return upward travel of the said plate 15, to fifth sensor means 31 for detecting the non-operative position of the

said pusher means 27.

2. A device according to the preceding claims, comprising, in the said station for forming a layer of articles, two vertical, opposite, guide walls for the articles in the layer under formation, positioned parallel to the infeed direction of the said conveyor means, characterized in that the said movable means 7 are constituted by at least two angular elements placed bilaterally with respect to the infeed direction F of the articles 4 into the forming station 1, the lower part of which is pivotally connected to the corresponding vertical walls 6 along axes parallel to the said direction F, each of the said angular elements 7 being subjected to elastic means 10 and having an upper limb 7a which, in cooperation with the said elastic means 10, adopts a horizontal position im which the extremity S of the said limb 7a protrudes laterally, with respect to the wall 6, towards the inside of the forming station 1.

(3) A device according to Claim 1, wherein the extremity 22 of the tubular guide member 21 turned towards the station R for filling the container 33 is shaped appropriately.

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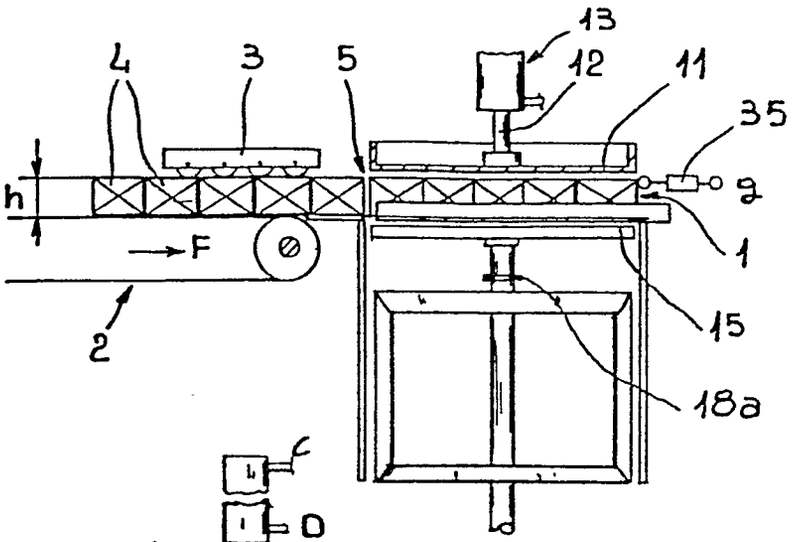


FIG1

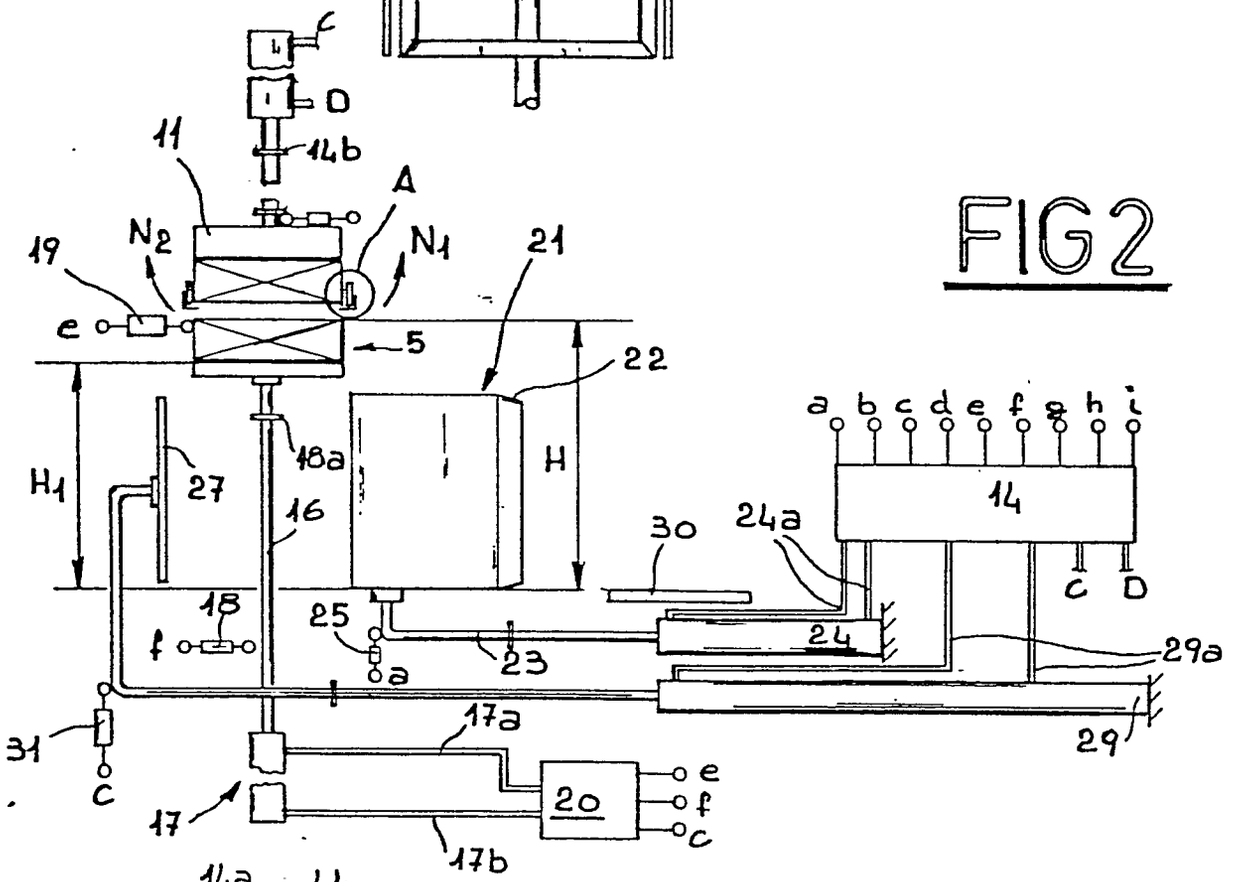


FIG2

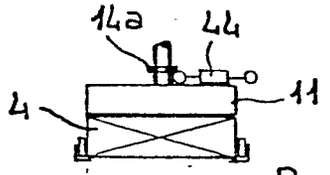
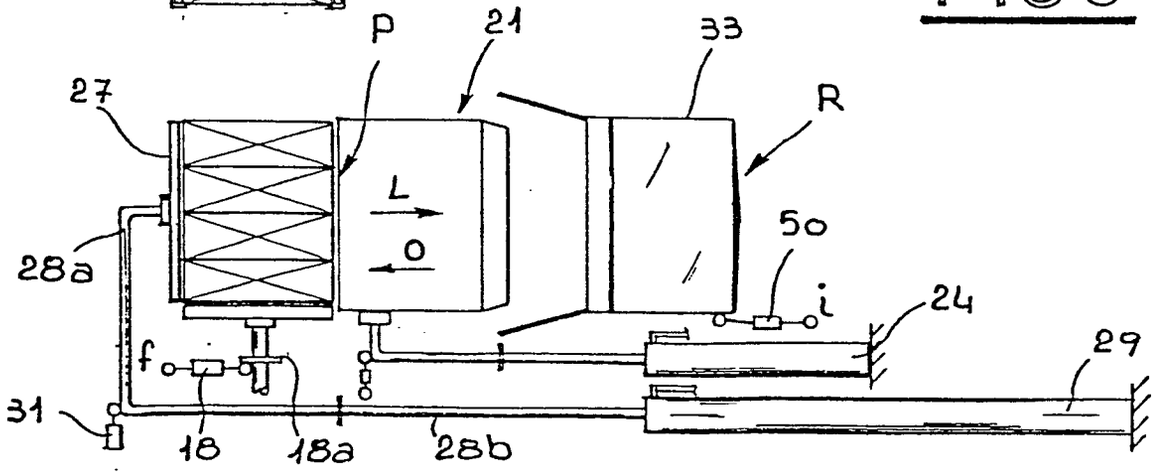


FIG3



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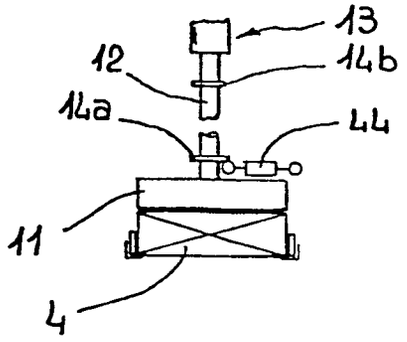
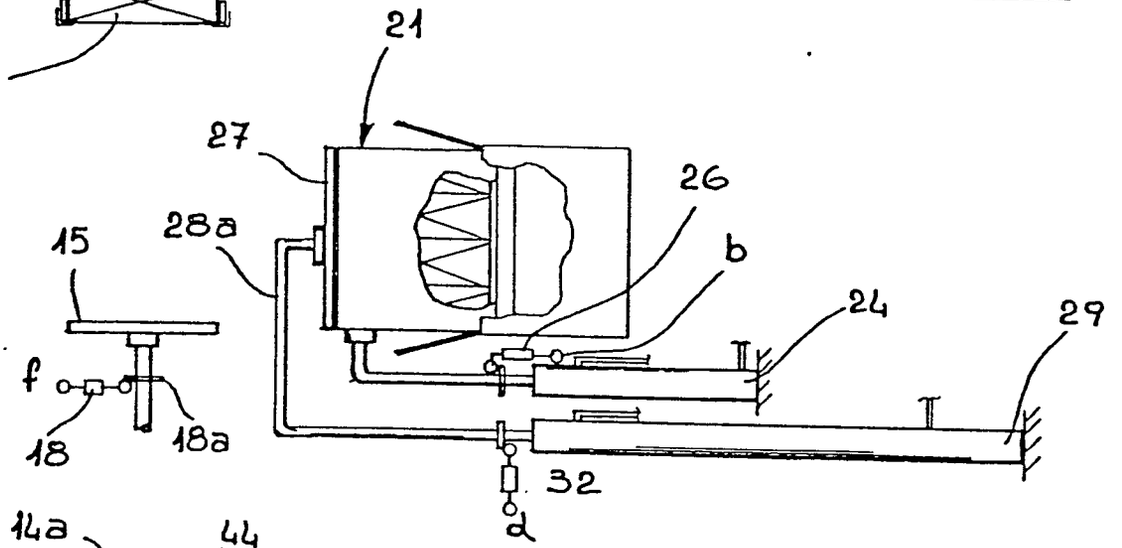
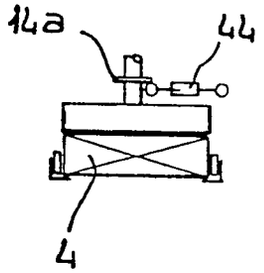


FIG 4





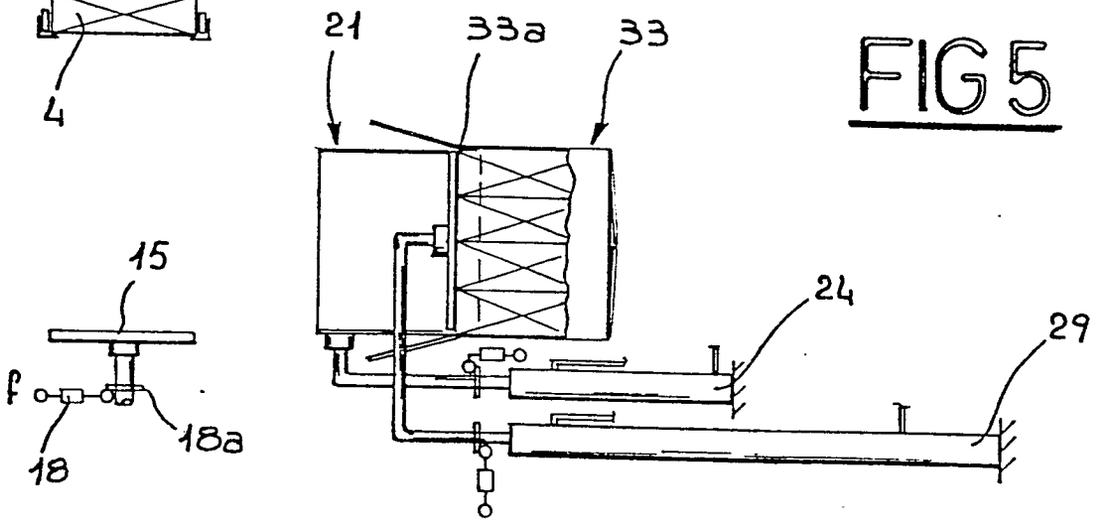


FIG 5

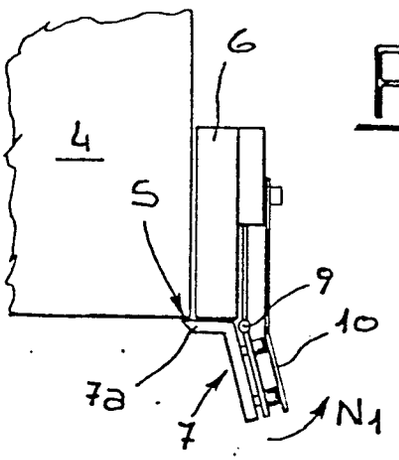


FIG 6

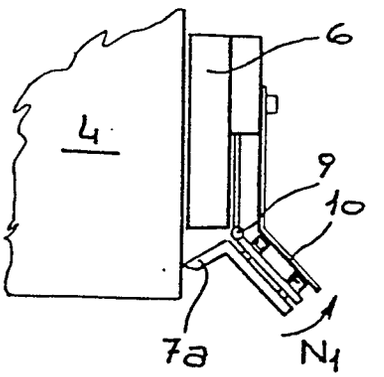


FIG 7

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 81 83 0042.8

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	DE - B2 - 2 250 682 (STORK-PACKO-MASCHINENBAU GMBH) * column 3, line 16 to column 4, line 43; fig. 1, 3 *	1,2
	GB - A - 1 305 093 (BAUER) * page 2, lines 73 to 103 *	1,2
	CA - A - 975 813 (PATCO PACKING LTD.) * page 4, lines 1 to 19, page 12, line 16 to page 13, line 29 *	1,2
	DE - U - 1 970 461 (SANDOZ AG) * claims 1 to 5, 8 *	1,3
	DD - A - 54 273 (BAU- UND MONTAGE-GMBH) * column 3, lines 20 to 35 *	1,3
	DD - A - 35 686 (NIEGEL) * fig. 1, 2 *	1
	DE - A - 2 248 520 (PACKO VERPACKUNGS-AUTOMATEN GMBH & CO KG) * page 7, lines 4 to 18 *	3
A	GB - A - 1 029 414 (UNILEVER LTD.)	
A	US - A - 4 086 745 (CAUDLE)	

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CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 65 B 5/06
B 65 B 35/50
B 65 G 57/06

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 65 B 5/00
B 65 B 35/00
B 65 B 63/00
B 65 G 57/00
B 65 G 65/00

CATEGORY OF CITED DOCUMENTS

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

Place of search	Date of completion of the search	Examiner
Berlin	11-06-1981	SIMON

EPO Form 1503.1 06.78

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Application number

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	DD - A - 110 226 (ROSENKRANZ et al.)		TECHNICAL FIELDS SEARCHED (Int. Cl.³)