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⑦① Applicant: **NORABRO AB, Box 179, S-713 00 Nora (SE)**

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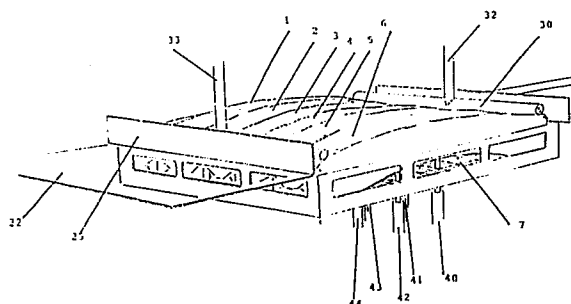
⑦② Inventor: **Sohlberg, Örjan, Vargtorpsvägen 1F,
S-713 00 Nora (SE)**
Inventor: **Broström, Ulf, Fagersand, S-713 00 Nora (SE)**

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⑦④ Representative: **Lautmann, Kurt O., KURT LAUTMANN'S
PATENTBYRA AB Box 245, S-691 25 Karlskoga (SE)**

⑤④ **A method of packing yielding objects and a means for performing the method.**

⑤⑦ When packing yielding objects (1-6) such as loaves of bread or the like in containers (7) such as trays, the intention is to fit as many objects (1-6) as possible into the container (7) even though the total outer dimensions of the objects somewhat exceed the packing dimensions of the container. According to the present invention this problem is solved by subjecting the objects to a downwardly directed force against at least two opposing edges of the objects and to an upwardly directed force at the centre of the lower sides of the objects, so that the object can be guided into the container and finally lowered into it when the upwardly directed force is removed. The invention also offers a means enabling said method of packing.



0233165

- 1 -

A method of packing yielding objects and a means for performing the method

The present invention relates to a method of automatically and continuously packing an optional number of yielding objects in a container. The invention also relates to a means for performing the method of packing said objects.

5 Known methods of packing yielding objects are based on manual packing into containers or automized packing where the full space available in the container is not utilized. Ways have been sought in the food industry and bakeries to enable better and more economic use to be made of existing space in a standard packing tray or crate.

10 The object of the present invention is to solve said problem of automized packing comprising feeding objects to be packed to a container, packing the objects in the container and removing the full container. This is achieved in that the objects are subjected to a downwardly directed force around all or a part of their periphery, and to an upwardly directed
15 force against their lower sides to guide them into the container, the upwardly directed force being subsequently discontinued and the objects in their entirety being pressed down in the container by the continuing downwardly directed force.

The object of the present invention is also to provide a means for per-
20 forming the packing method described above.

Additional embodiments and features of the present invention are revealed in the accompanying claims.

One embodiment of the present invention will now be described with reference to the accompanying drawings.

25 Figure 1 shows the packing means according to the invention,
Figures 2-4 show the packing unit and
Figures 5-7 show a packing cycle.

In the drawings, 1-6 denote objects to be packed into a container 7. In the embodiment described here the objects 1-6 are six one-kilo loaves of sliced bread which are to be packed in a standard tray 7. Nowadays five one-kilo sliced loaves are packed into a standard tray 7. The present invention enables six one-kilo loaves to be packed into the tray without detriment to the wrappings or their contents. The area of the tray 7 is thus somewhat less than the total area of the six loaves to be packed therein. The packing means comprises a feeder 10, a packer 20 and a unit 50 for feeding empty trays to the packer 20 and for removing full trays.

The feeder 10 comprises a continuous conveyor 11 running around two horizontal rollers 12 and 13, one of the rollers being electrically driven, for instance. Guide plates 14 and 15 are provided along the sides of the conveyor to guide the loaves 1-6. A vertically movable pusher is also provided, which is movable in the feeding direction along the entire length of the conveyor. The pusher 19 extends substantially transversely across the full width of the conveyor.

A bottom plate 27 is arranged in the packing unit 20, on which the tray 7 rests during packing. An arbitrary number of through-holes 280-285 are provided along the mid-line of the bottom plate 27 and on both sides of this in the direction of feed. In the example shown, the holes 280-285 are arranged in three rows. The rows shown here extend not quite to the edges of the bottom plate 27 perpendicular to the direction of feed. The reason for this will be explained later on. Vertically movable members 40-45 can be passed through the holes 280-285. The vertically movable members consist here of compressed-air cylinders. As can be seen in Figures 3 and 4, the cylinders protrude through the holes when raised and are withdrawn below the horizontal plane of the bottom plate 27 when lowered. The compressed-air cylinders are operated by a compressed-air source and are in communication with each other so that the pressure is distributed uniformly between the cylinders. This is particularly valuable if the cylinders are subjected to uneven load, since pressure-equalization is then obtained. Alternatively, the cylinders may be permanently joined together. The bottom plate 27 is also provided with ventilation apertures 290-295 which facilitate the removal of air during

packing. The tray 7 is located on the bottom plate 27 during packing, and arranged so that cylinders 40-45 can be passed up through the holes in the bottom of the tray. The packer is also provided with two horizontal plates 21 and 22 which can be moved towards or away from each other, e.g. with the aid of compressed air, in a direction perpendicular to the direction of feed. Figure 2 shows the plates 21 and 22 pushed together, while Figure 3 shows them pushed apart. The horizontal plane of these plates coincides substantially with the feeding plane of the conveyor 11. Two elongate members 30 and 31 are arranged above the horizontal plane of the plates, with their longitudinal axes parallel to each other and to the direction of feed. The longitudinal members 30 and 31 are substantially the same length as the length of the tray in direction of feed. The members, which are vertically movable, are arranged each in a vertical plane just inside the side edges of the tray, parallel with the direction of feed. The elongate members 30 and 31 are fitted on arms 32 and 33, respectively, which transmit force from a compressed-air source to the members. The members are in this example operated as a unit, but could equally well be arranged for individual operation. The loaves and the tray are aligned by means of plates 23, 24 and 25 before the loaves are packed into the tray. Plates 23 and 25 are stationary, whereas plate 24 is movable perpendicularly to the direction of feed.

A driver (not shown) is arranged below the plate 22 to assist in feeding an empty tray from unit 50. Since the plate 22 moves perpendicularly to the direction of feed of the bread, the direction of feed of the trays will also be perpendicular to that of the bread. The means according to the invention functions automatically and continuously and is set and controlled by computer. The loaves 1-6 are placed in arbitrary manner one after the other on the conveyor 11, with their longitudinal axes perpendicular to the direction of feed. The number of loaves, in this case six, is counted by a photocell. The plates 21 and 22 are pushed together to receive the bread being fed along by the conveyor 11 and pusher 19. The loaves are aligned and packed tightly together on plates 21 and 22 by the stationary alignment plates 23, 25 and the movable plate 24 and pusher 19. At the same time as the plates 21 and 22 are pushed together, a tray 7 is carried in below the plates 21 and 22 and will therefore be

located immediately below the loaves. The compressed-air cylinders 40-45 are now raised through the holes in the bottom plate 27 and through holes in the tray 7 and will rest against the lower side of the plates 21 and 22. The plates 21 and 22 are now moved apart so that the loaves at or close to their mid-points will rest on one or more cylinders. The length of the loaves somewhat exceeds the distance between the sides of the tray opposite each other and parallel to the direction of feed. The elongate members 30 and 31 are lowered towards the short sides of the loaves. The loaves will now be subjected to a downwardly directed force at the outer ends while the cylinders exert an upwardly directed force near to the middle of the lower side of the loaves. The loaves will thus be slightly curved, enabling the ends to be inserted into the tray. Immediately the ends of the loaves have been inserted into the tray, the cylinders 40-45 are lowered and the loaves are then guided fully down into the tray by the pressure from the elongate members 30 and 31. As mentioned above and can be seen in Figure 4, for instance, the holes 280-285 do not extend quite to the side edges of the bottom plate 27 perpendicular to the direction of feed. The outermost loaves 1 and 6 are thus not subjected to upwardly directed force at or near to their outwardly facing long sides. These sides will therefore be more easily guided into the tray, by the downwardly directed force from the elongate members 30 and 31. When the tray is full it is removed by the unit 50 in the direction of feed. In the cycle described above six new loaves can be supplied to the feeding unit 10 before packing of the preceding six loaves is complete. The speed of the cycle and the duration of the various stages is set by computer.

The method and means for packing according to the invention are not limited to packing bread but are generally applicable. The invention allows yielding objects to be combined to a unit which is subjected to an upwardly directed force against the lower side of the objects and to a downwardly directed force at or near the periphery of the units on the upper side. The lower side of the unit in the horizontal plane will therefore have smaller area than its upper side in the horizontal plane. The unit is therefore wedge-shaped and can easily be inserted into the container.

Holes 280-285 and cylinders 40-45 may be optionally arranged over the whole or parts of the bottom plate 27. All, or an optional number of cylinders may be activated by a computer 60. This enables objects of different sizes and different location in the container can be packed.

5 Other parts of the upper side of the objects than said periphery may also be influenced by a downwardly directed force by an alternative design of the members 30 and 31.

CLAIMS

1. A method of automatically and continuously tightly packing an optional number of yielding and substantially identical objects in a container, comprising the steps of feeding the objects to the container, packing the objects in the container and removing the full container, c h a r a c t e r i s e d in that when being packing into the container (7), all the objects (1-6) are subjected to a downwardly directed force around all or a part of their periphery, and to an upwardly directed force against their lower sides to guide them into the container (7), the upwardly directed force being subsequently discontinued and the objects (1-6) in their entirety being pressed down in the container (7) by the continuing downwardly directed force.

2. A method according to claim 1, c h a r a c t e r i s e d in that while being packing into the container (7), after being fed to the container, the objects are placed in a substantially horizontal plane at or close to the upwardly facing, open side of the container (7), the objects (1-6) being pressed together and centred so that their total area in the horizontal plane substantially coincides with the area of the open side of the container (7), after which all the objects are subjected from above to a substantially vertical, downwardly directed force near all or parts of the outwardly facing sides, and to a substantially vertical, upwardly directed force at the lower sides of the objects, enabling the objects to be guided into the container, whereupon the vertical, upwardly directed force is discontinued and the objects are guided down into the container (7) by means of the continuing vertical, downwardly directed force.

3. A method according to claim 2, c h a r a c t e r i s e d in that the objects (1-6) are substantially parallelepipedic in shape and that feeding of the objects (1-6) to the container (7) is preferably effected with their longitudinal axes parallel to each other and perpendicular to the direction of feed.

4. A method according to claim 3, characterised in that said downwardly directed force is produced by at least two substantially parallel, elongate members (30 and 31), said members arranged with their longitudinal axes in the feeding direction and acting at or near the short sides of the objects (1-6), substantially parallel to the direction of feed.

5. A method according to any of the preceding claims, characterised in that said upwardly directed force is produced by members (40-45), vertically movable through the bottom of the container, the number of said members and their arrangement being such that each object (1-6) is influenced at or near the centre of its downwardly facing surface by one or more of the vertically movable members (40-45).

6. A method according to claim 5, characterised in that the first object (1) and the last object (6) in the direction of feed are subjected only to upwardly directed force at respective inner edges perpendicular to the direction of feed.

7. A method according to any of the preceding claims, characterised in that said members (40-45) consist of compressed-air cylinders, said cylinders communicating with each other and with a source of compressed air.

8. A means for performing the method of automatically and continuously tightly packing yielding objects in a container, according to claim 3, said means consisting of a feeder (10) for feeding the objects to the container, a packer (20) for packing the objects in the container and a unit (50) for feeding forward empty containers and removing full containers, characterised in that said packer (20) consists of two substantially horizontal plates (21, 22), movable towards and away from each other in the horizontal plane in a direction of movement perpendicular to the direction of feed, said plates (21 and 22) being arranged in a plane close to the upwardly facing open plane of the container (7) below and being moved towards each other when feeding forward an optional number of objects (1-6) and moved away from each

0233165

other and from the open plane of the container when the objects are being packed, of members (23, 24, 25 and 19) to bring together and compress the objects when they have been fed forward on the horizontal plates (21 and 22), by at least two elongate members (30 and 31) parallel to each other and the direction of feed and vertically movable, said members arranged to produce a force directed against the upper side of the objects, at the side edges parallel to the direction of feed, by members (40-45) vertically movable through the bottom of the container and arranged at the entire bottom plane of the container or parts thereof in such a way and sufficiently close for the lower sides of each object to be influenced by one or more vertically movable members (40-45), said members preferably consisting of compressed air cylinders linked together, and of a stationary, preferably ventilated bottom plate (27) on which the container (7) rests during packing and through which said vertically movable members (40-45) are passed.

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FIG 2

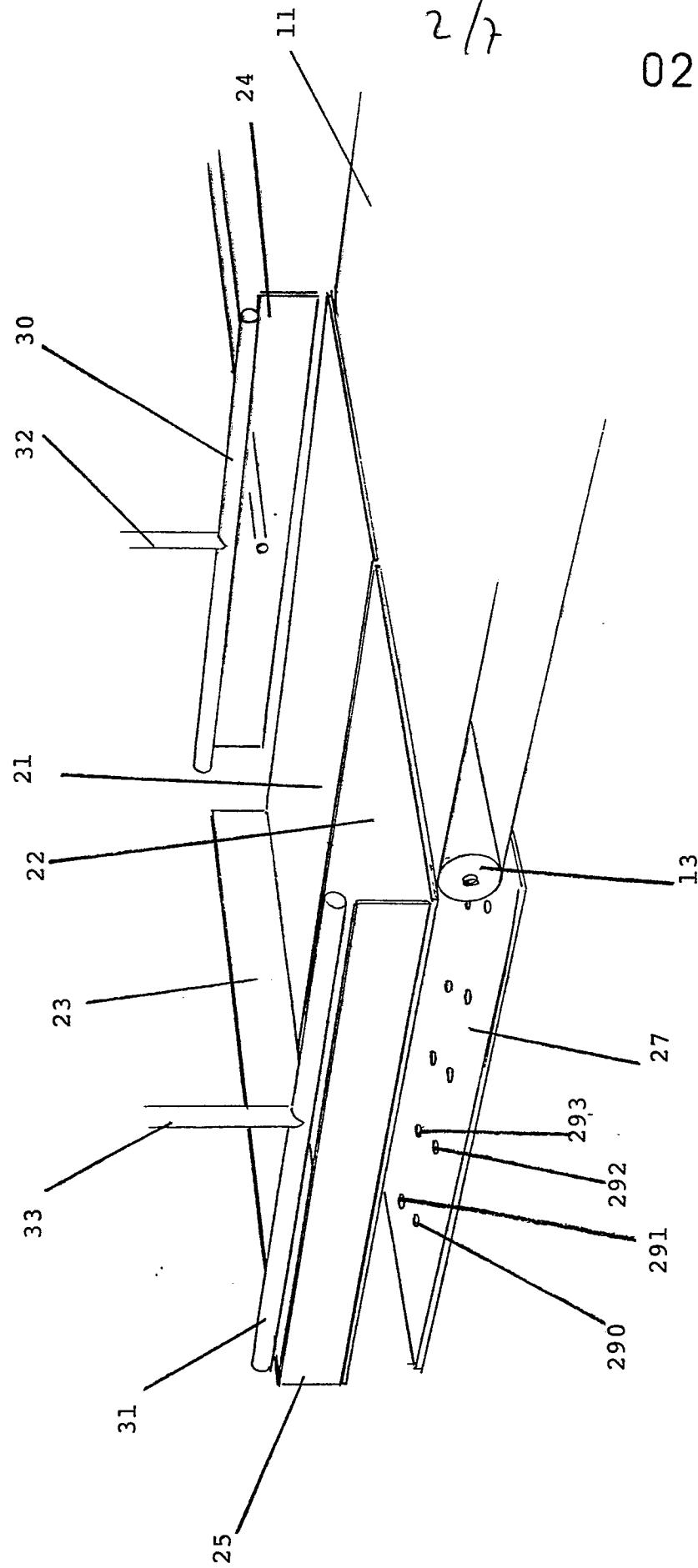
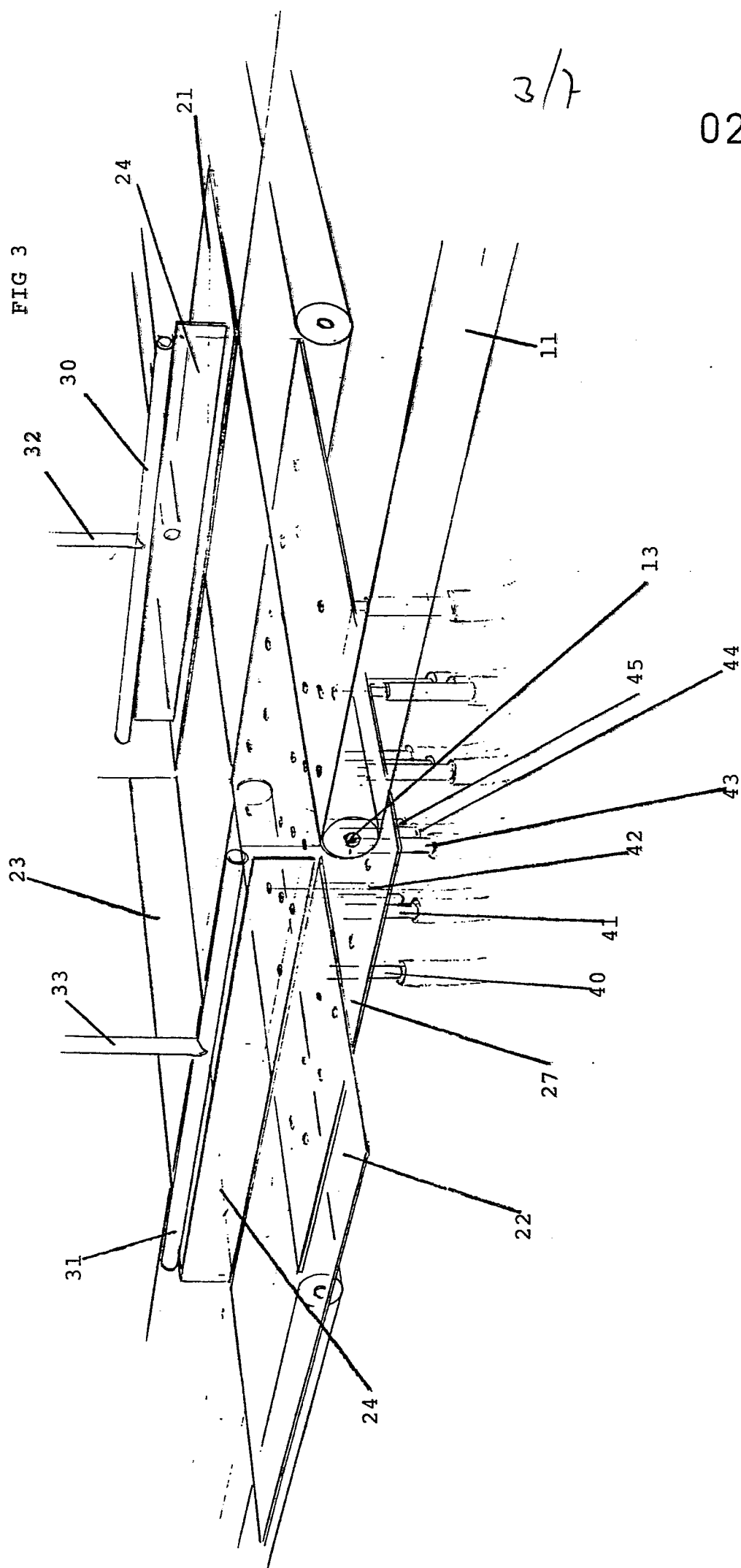


FIG 3



4/7

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FIG 4

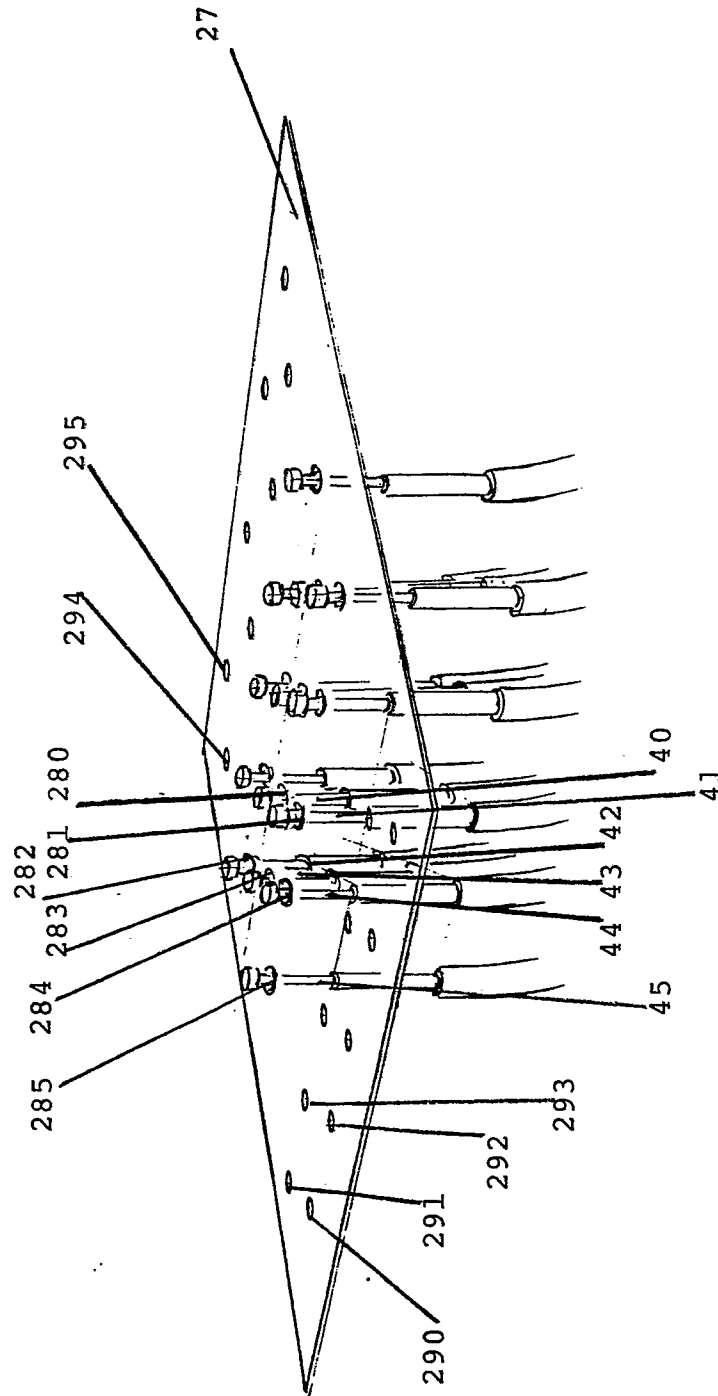
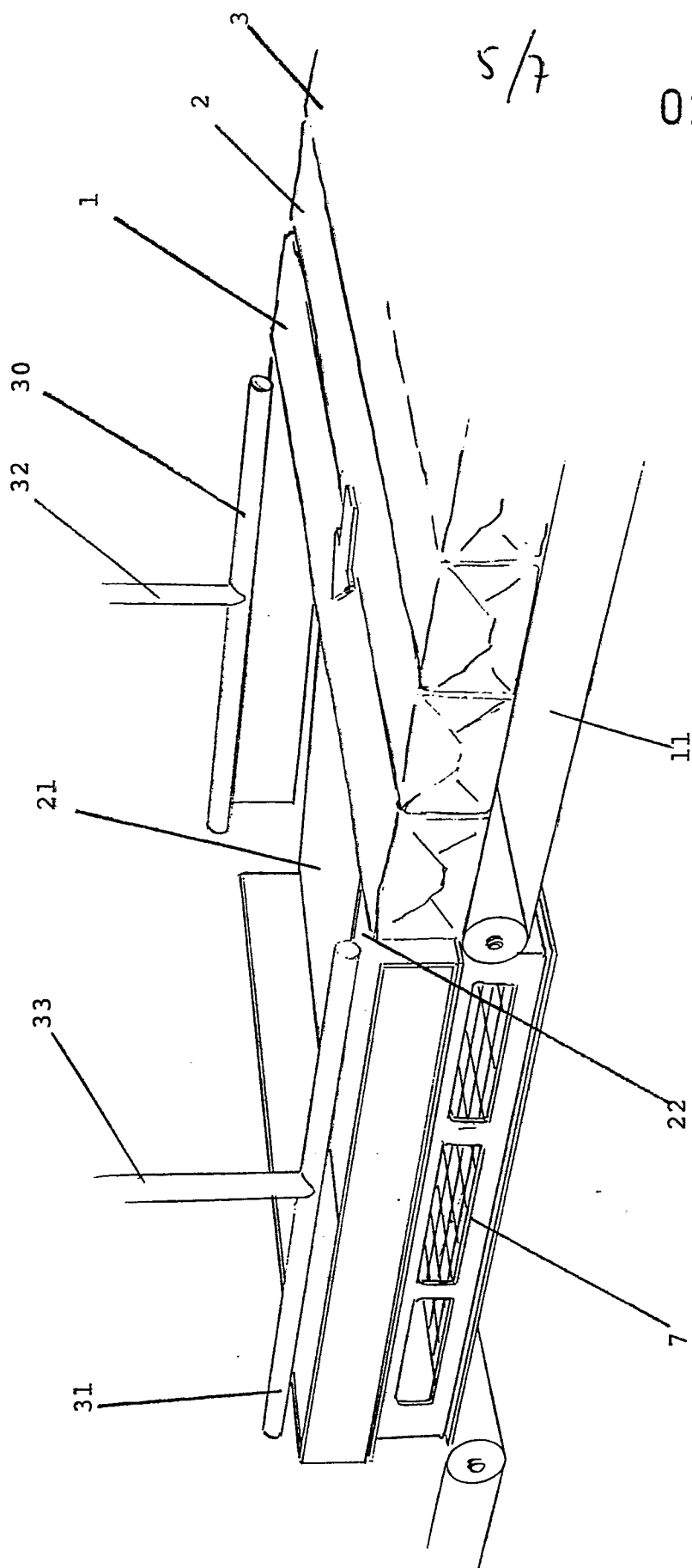
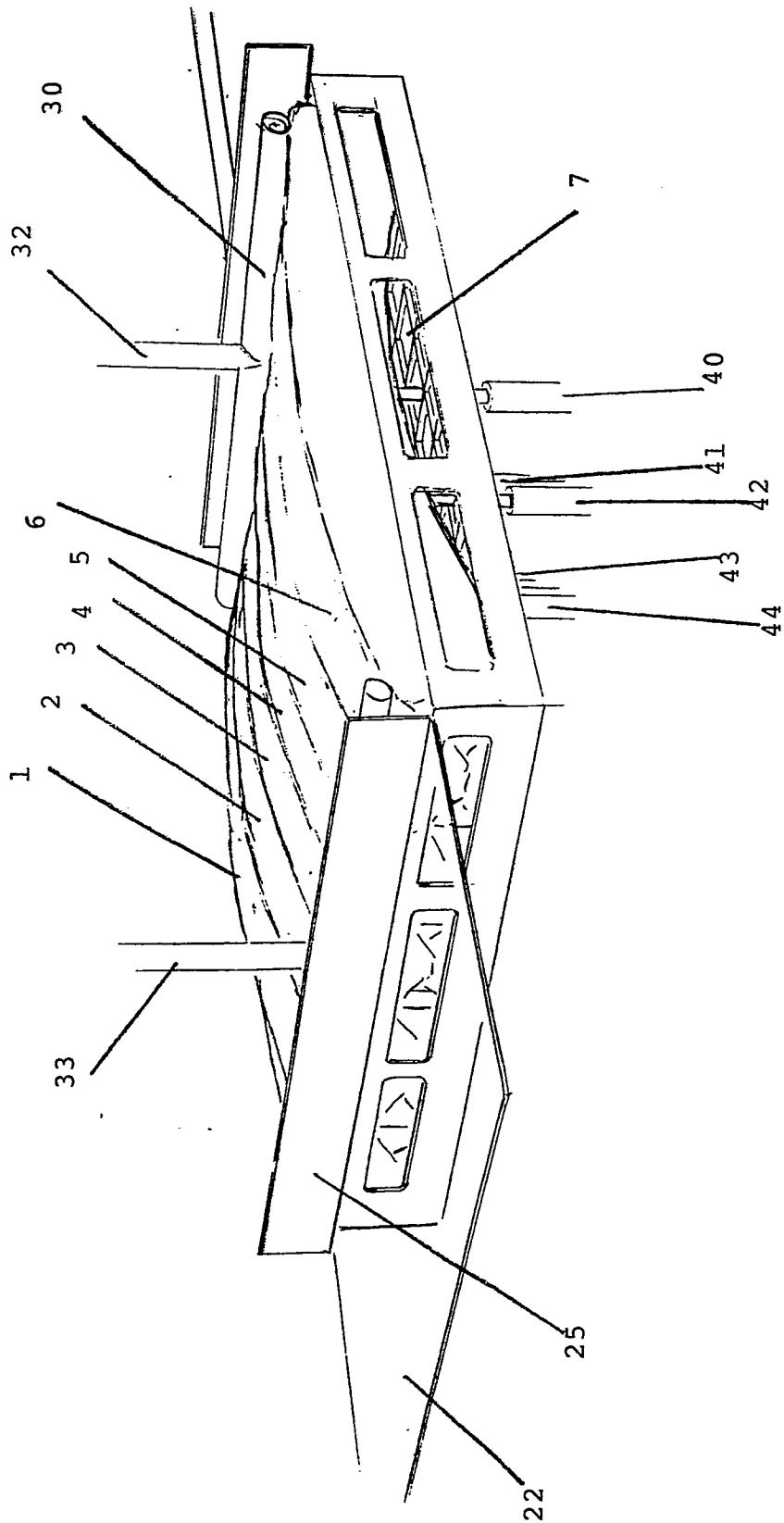


FIG 5



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FIG 6



7/7

0233165

FIG 7

