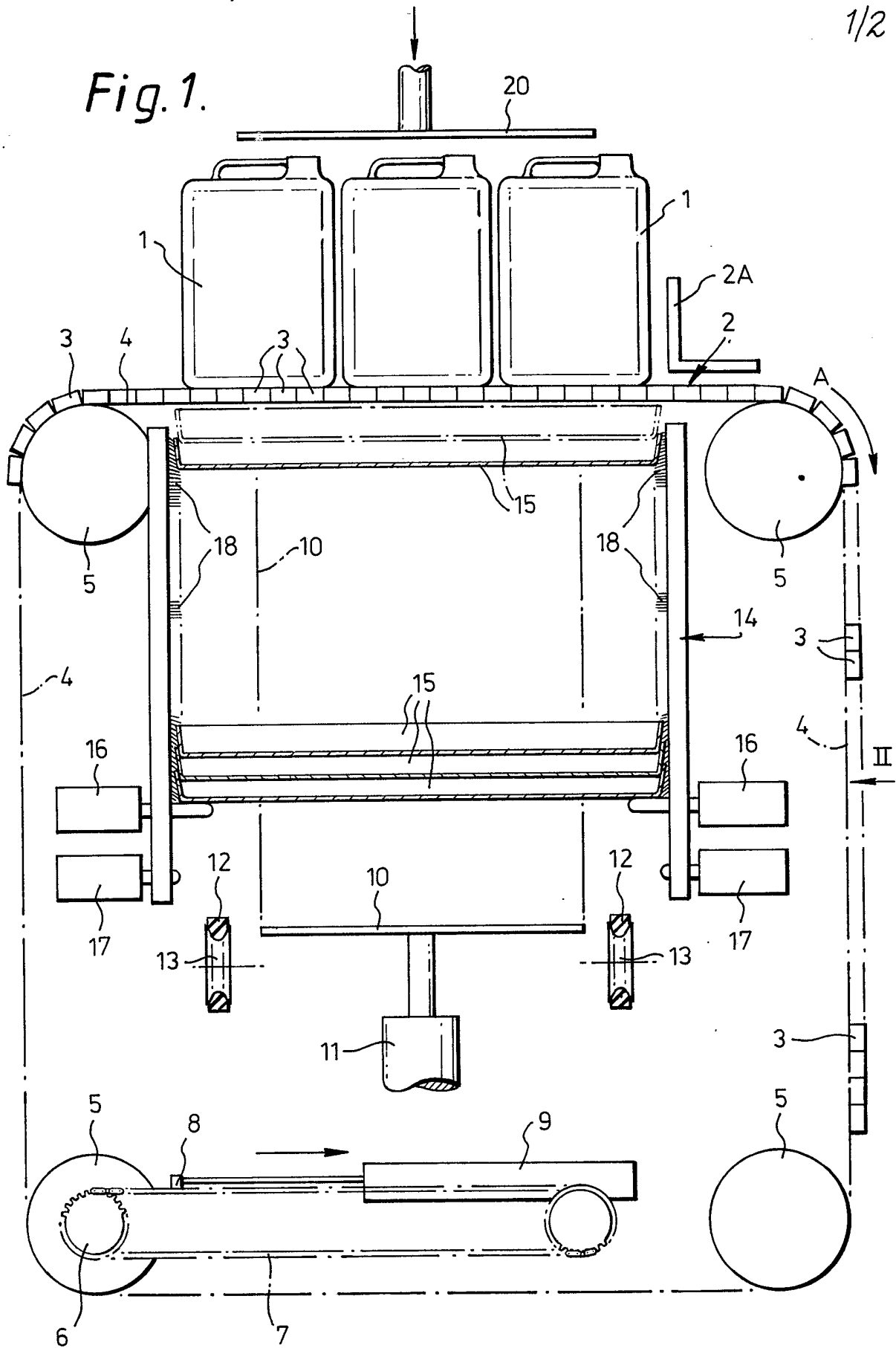


Fig. 1.



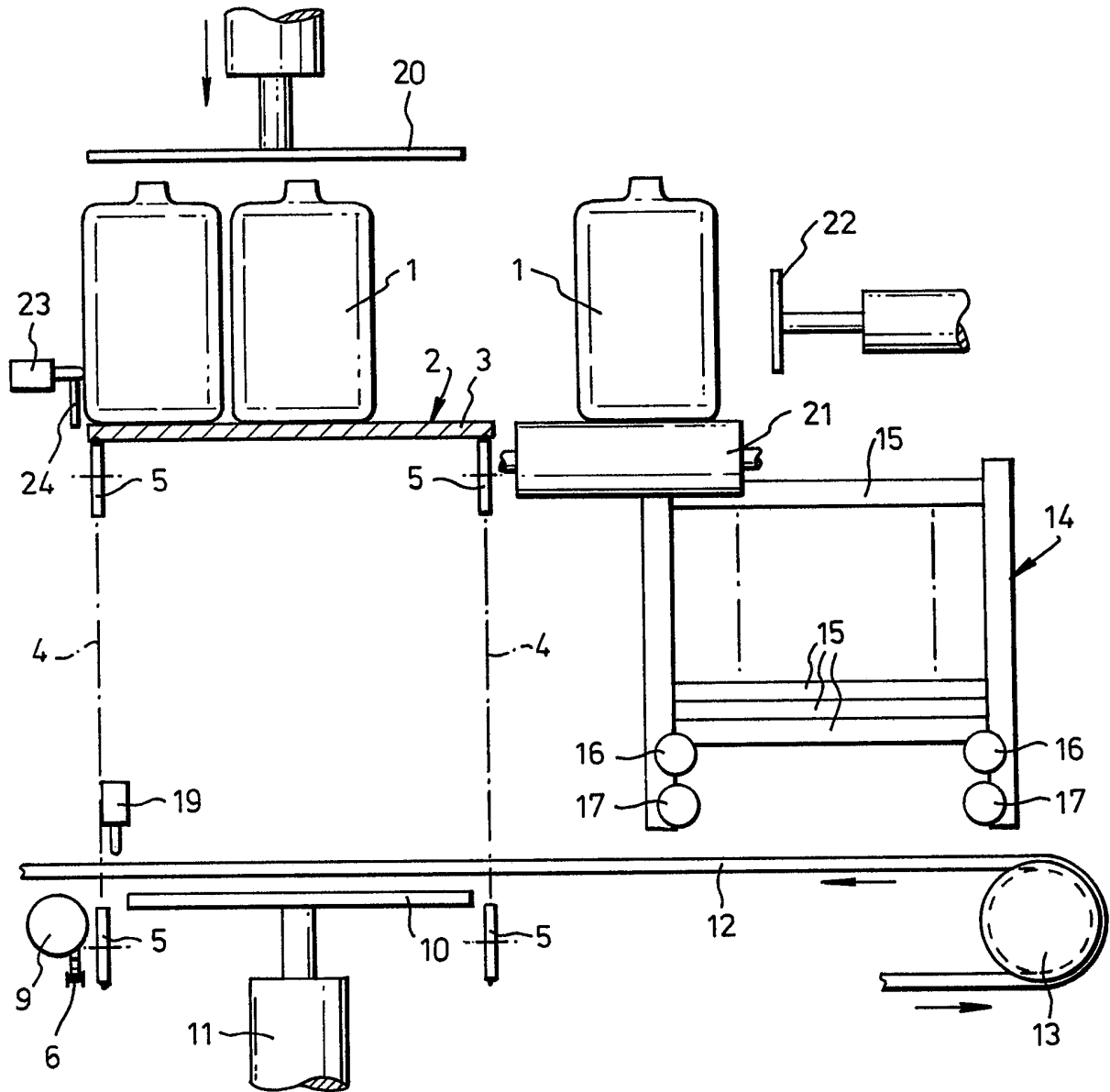


Fig. 2.

SPECIFICATION

Machine for packing articles in trays

This invention relates to a machine for packing articles into trays.

5 Packing machines are known in which articles for packing in trays are assembled on a horizontal platform or conveyor from which they are subsequently released to drop under gravity into a horizontal tray. A practical difficulty associated with such machines is that the articles to be packed can become dislodged during the drop from the assembly platform or conveyor into the tray, particularly if the articles are of substantial bulk. This in turn can impede the efficiency of the speed of operation of the machine.

15 An object of the present invention is to provide a packing machine which is efficient and positive in operation, allowing bulky articles of light weight, for example, empty plastic containers, to be loaded positively into trays.

20 According to the present invention there is provided a machine for packing articles into trays comprising elevating means for lifting a tray to a loading position below a horizontal article collection platform means for displacing the article collection platform horizontally to allow the articles to fall into the tray at the loading position, and a conveyor onto which the loaded tray is deposited by subsequent descent of the elevating means from the loading position.

30 By elevating each empty tray to a loading position it can be arranged that the articles collected on the platform have to drop through only a short distance to be loaded into the tray, thereby minimising the risk of disturbance or displacement of the articles during their displacement from the platform into the tray. To further assist the positive loading of the articles into the trays, a powdered pusher element is preferably provided for pushing the collected articles downwardly into the tray at the loading position when the collection platform has been displaced horizontally to release the articles.

45 The article collection platform preferably comprises an assembly of support slats forming a conveyor which passes around pulleys or guide rollers, the conveyor being movable to effect horizontal displacement of the collection platform in its own plane. The displacement of the article collection platform may be effected by a convenient means. In a preferred embodiment the support slats forming the article collection platform are interconnected by belts, chains or cables passing around guide pulleys.

50 Displacement of the platform may be effected by a linear actuator, preferably a pneumatic actuator, connected to one of the belts, chains or cables, or to one of the guide pulleys.

60 The conveyor for receiving the loaded trays is preferably a continuously moving conveyor which, as well as receiving the loaded trays from the elevating means, also delivers empty trays in succession to the elevating means. Empty trays for supply singly in succession elevating means may

65 be stacked vertically in a magazine from which the trays are released one at a time to fall vertically onto the conveyor which conveys each empty tray to a position vertically below the loading position, at which the tray encounters a stop valve which triggers the operation of the elevating means to lift the tray vertically to the loading position.

70 In order to ensure separation of the trays in the magazine one or more brush elements may be provided on one or more sides of the magazine to make contact with the edges of the trays as the latter descend in the magazine. Release of the lowermost tray from the magazine onto the continuously moving conveyor may be effected by a retractable stop or stops at the bottom of the magazine, operation of which to release the lowermost tray being initiated when a full complement of articles has been assembled on the collection platform. Thus in one embodiment of the invention the articles may be displaced in successive rows onto the article collection platform, in a horizontal direction transverse to the direction of displacement of the platform, the first row of articles loaded onto the platform engaging a trip element to initiate a tray-loading sequence when a full complement of articles has been assembled on the collection platform.

80 The invention will be further described, by way of example only, with reference to the accompanying purely diagrammatic drawings, in which:

85 Figure 1 is a side elevation and partly sectional view of a packing machine according to one embodiment of the invention, and

90 Figure 2 is an end view of a machine shown in Figure 1, taken in the direction of arrow II in Figure 1.

95 The illustrated machine is intended for the packing of bulky lightweight articles, in this case plastics containers 1 into shallow trays for storage and transportation. The machine includes a horizontal article collection platform 2 which consists of an assembly of flat support slats 3 supported at opposite longitudinal ends by a pair of endless chains or cables 4 passing around fixed pulleys 5, so that upon displacement of the cable 105 the slats 2 can pass around the pulleys in the manner of a roller blind, as illustrated diagrammatically in Figure 1.

110 One of the pulleys 5 is drivingly connected to or formed integrally with a drive sprocket 6 engaged by an endless chain 7. One of the links of the chain 7 supports a drive member 8 which is coupled to the piston rod of a double acting pneumatic actuator 9. The actuator 9 is so arranged that when it makes a complete stroke the drive member is displaced over a linear part of the endless chain 7, and imparts rotation to the pulley 5 coupled to the sprocket wheel 6. Since the pulley 5 has a larger diameter than the sprocket wheel 6 in the illustrated embodiment, the displacement imparted to the cables 4 is greater than the displacement of the drive member 8, so that a magnification effect occurs, sufficient to cause the slats 3 forming the collection platform 2

to move around one of the pulleys 5. At one stroke limit position of the actuator 9 the slats form a horizontal platform 2 at the upper end of the machine, as illustrated in Figure 1, while at the other stroke limit position of the actuator 9 the slats 3 lie in a substantially vertical plane on one side of the machine, as illustrated by the broken line in Figure 1.

A vertically movable elevator 10 is arranged directly below the horizontal article collection platform 2. The elevator 10 comprises a flat support plate which is movable vertically by a pneumatic actuator 11 between a retracted position shown in full lines in Figure 1, and an extended position, shown in broken outline, in which the elevator plate is approximately 3 inches below the level of the horizontal article collection platform 2.

A continuously moving conveyor comprising two parallel endless V-belts 12 driven around respective vertical pulleys 13 is arranged so that the upper conveying surface of the conveyor belts 12 is slightly higher than the surface of the elevator plate 10 when the latter is in its lowered or retracted position, shown in Figure 1.

A magazine 14 for empty trays 15 to be filled with articles is arranged above the continuously moving conveyor belts 12, but spaced horizontally from the elevator 10, as shown in Figure 2, the magazine 14 being lower than the article collection platform 2. The magazine 14 includes two pairs of pneumatic actuators 16, 17 arranged on opposite sides of the magazine, one pair 16, being higher than the other pair 17, the actuators of each pair acting in unison with each other by connection to a common air line. The actuators 16, 17 are double acting, the upper pair of actuators being always in the opposite stroke limit position to the lower pair of actuators. Thus when the upper actuators 16 are extended the lower actuators 17 are retracted and *vice versa*. The arrangement, and the vertical spacing of the two pairs of actuators 16, 17, are such that the lowermost tray 15 of a stack of trays in the magazine 14 is supported on the upper actuators 16 while a tray 15 is deposited upon the conveyor belts 12 by retraction of the lower actuators 17. Successive operation of the actuators 16, 17 in alternation will result in the depositing of single trays 15 in succession on the continuously moving conveyor belts 12 from the magazine 14.

To ensure that the stacked trays 15, which would normally be nested within one another, are separated from each other as they descend through the magazine 14, the vertical guides of the magazine 14 on the shorter sides thereof are equipped with vertically extending brush elements 18 which make contact with and exert a frictional force on the shorter sides of the stacked trays 15 as the latter descend through the magazine.

Associated with the vertically movable elevator plate 10 is a pneumatic trip valve 19 (Figure 2) at the end of the elevator plate remote from the magazine 14. The trip valve 19 is arranged to be engaged by a tray 15 as it passes over the elevator

plate 10 on the conveyor belt 12, tripping of the valve 19 causing extension of the actuator 11 to effect rapid lifting of the elevator plate 10, raising the tray 15 from the conveyor belt 12 to a loading position, shown in broken outline in Figure 1, a short distance below the horizontal article collection platform 2. A further trip valve (not shown) is operated when the tray 15 reaches the loading position to cause operation of the actuator 9 in a sense to displace the slatted collection platform 2 in the direction of the arrow A into its vertical position, shown in broken outline in Figure 1. Horizontal movement of the articles 1 is prevented by a fixed stop 2A at one end of the platform 2. The rapid removal of the platform 2 causes the collected articles 1 to drop into the elevator tray 15.

To assist in the positive location of the collected articles 1 in the tray 15 a pneumatically actuated vertically movable pusher element 20 is arranged above the article collection platform 2 and is controlled by a pneumatic circuit so that it is actuated to descend and push the articles 1 downwards immediately after the article collection platform 2 has been retracted by the actuator 9. The pusher element 20 may have a vertical stroke such that it follows the entire descent of the loaded tray 15 as the platform 2 descends.

The assembly of articles 1 on the collection platform 3 is effected by any convenient collating means. For example, the articles 1 may be fed to the machine singly at a time on a moving conveyor 21 from which the articles are displaced in rows by a horizontal pusher actuator 12 (Figure 2) which displaces each successive row of articles 1 onto the platform 2. When the platform 2 is full, that is, when the first row of articles 1 pushed onto the platform 2 has reached the opposite end of the platform 2 from the pusher actuator 22, a pneumatic valve 23 incorporated in a lateral stop 24 may be actuated by the articles themselves to initiate the packing sequence described above.

Once the assembled articles 1 have been pushed into the elevated tray 15 the latter is allowed to descend by retraction of the actuator 11, if necessary accompanied by extension of the actuator of the pusher 20, until the loaded tray 15 rests on the continuously moving conveyor belts 12, which will then automatically convey the loaded tray to a delivery or collection station or a wrapping machine.

CLAIMS

1. A machine for packing articles into trays comprising elevating means for lifting a tray to a loading position below a horizontal article collection platform, means for displacing the article collection platform horizontally to allow the articles to fall into the tray at the loading position, and a conveyor onto which the loaded tray is deposited by subsequent descent of the elevating means from the loading position.

2. A machine according to Claim 1, in which the article collection platform comprises an

assembly of support slats forming a conveyor which passes around pulleys or guide rollers the conveyor being movable to effect horizontal displacement of the collection platform.

- 5 3. A machine according to Claim 1 or Claim 2, including a powered pusher element for pushing the collected articles downwardly into the tray at the loading position when the collecting platform has been displaced horizontally to release the
- 10 articles.
4. A machine according to any one of Claims 1 to 3, in which the conveyor is a continuously moving conveyor which, as well as receiving the loaded trays from the elevator means, also
- 15 delivers empty trays in succession to the elevating means.
5. A machine according to Claim 2, in which the support slats forming the article collection platform are interconnected by belts, chains or
- 20 cables passing around guide pulleys, displacement of the platform being effected by a linear actuator connected to one of the belts, chains or cables, or to one of the guide pulleys.
6. A machine according to any one of the
- 25 preceding claims including a magazine in which empty trays may be stacked vertically, and means for releasing trays one at a time from the magazine to fall onto the conveyor which conveys

the empty tray to a position below the loading position.

- 30 7. A machine according to Claim 6, in which one or more brush elements are provided on one or more sides of the magazine to make contact with the stacked trays as the latter descend in the
- 35 magazine, to ensure separation of the trays.

8. A machine according to Claim 6 or Claim 7, in which a retractable stop or stops at the bottom of the magazine controls the release of the lowermost tray from the magazine onto the conveyor, retraction of the stop or stops to release

40 a tray being initiated by means responsive to the assembly of a full complement of articles on the collection platform.

9. A machine according to any one of the

45 preceding claims, in which the articles are displaced in successive rows onto the article collection platform, in a horizontal direction transverse the direction of displacement of the platform, the first row of articles loaded onto the

50 platform engaging a trip element to initiate a tray-loading sequence when a full complement of articles has been assembled on the collection platform.

10. A machine for packing articles into trays

55 substantially as herein described with reference to and as shown in the accompanying drawings.