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(54) Machine for applying parts to material

(57) In an off-line, free-standing, parts-orienting and - feeding device 16, selected parts are fed by a hopper 26 to, and oriented in, a centrifugal or vibratory parts feeder unit 22, and then discharged to a programmed transferring arrangement. The latter includes a slide shuttle unit for alternately receiving discharged parts in a plurality of passages and aligning the parts-receiving passages with one or more pressurized air passages to blow the parts through selected transfer tubes 14 to pick-and-placement devices 74 which serve to place the parts continually one-at-a-time on packaging materials being processed on one or more packaging machines 10. Limit devices 72 on each transfer tube 14 signal the slide shuttle unit to realign the parts-receiving passages with the pressurized air passage(s), to provide parts as required by the or each machine 10.

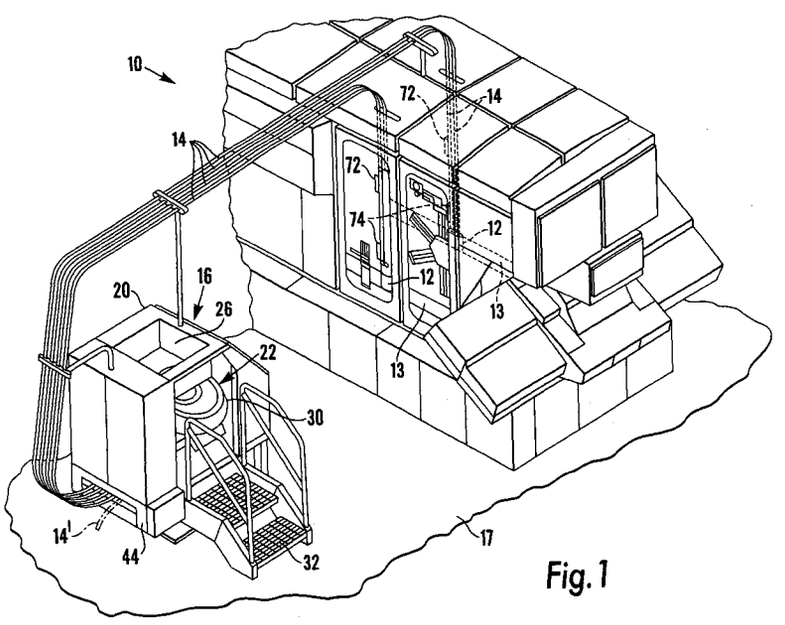

Fig. 1

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Description

[0001] This invention relations to application of parts to material and, more particularly, to a system wherein selected parts are hopper-fed to and oriented in a parts feeder unit, and then fed from the unit for placement of the parts on material being processed on a machine.

[0002] In a case where small parts being handled are pour spout fitments for attaching to formed cartons, it is known to remove the fitments one-at-a-time from the exit end of a track and place each fitment through an opening in a top closure panel of a standing, open-topped carton, to be welded into place by an external ultrasonic welding horn. Such placement and welding units are shown and described in GB-A-2,238,287; US-A-4,788,811; US-A-4,386,923; US-A-5,484,374; US-A-5,267,934 and US-A-5,435,803.

[0003] WO-A-80/02018 discloses apparatus for attaching pour spout fitments to pouches. A vertical form-fill-seal machine receives the fitments from the lower end of a chute supplied at its upperend with fitments of a vibratory-type feed bowl. The bowl in turn receives the fitments from the lower end of a discharge chute of a supply hopper. The bowl and the hopper are mounted on the tops of respective posts adjacent to the machine.

[0004] WO-A-94/08851 discloses apparatus for the production of bag-in-box packages, to the bags of which are attached fitments each in the form of a pouring neck welded to the bag and an openable pouring stopper mounted on the neck. The fitments are supplied by a vibrating bowl to a motorized conveyor belt fitted with dogs and moving in a substantially U-section rail. The conveyor belt is essentially S-shaped, the upper horizontal section thereof ending in a vertical magazine in which the fitments accumulate while waiting to be welded onto the bags. The magazine ends above a machine for manufacturing and filling the bags.

[0005] According to a first aspect of the present invention, there is provided in combination,

at least one machine including parts-applying means for applying parts to material on said machine(s),

a parts-supplying device including parts-supplying means, and

transferring means extending from said device to said machine(s) and serving to transfer said parts from said device to said machine(s),

characterized in that the transferring means comprises a plurality of transfer tracks and said device further includes a discharge track for discharging said parts and a distributor arranged to receive said parts from said discharge track and to distribute them among said transfer tracks.

[0006] Owing to this aspect of the invention, it is possible for a single parts-supplying device to serve a plurality of parts applicators, whether on one-and-the-same machine, or on respective machines, or both.

[0007] According to a second aspect of the present invention, there is provided in combination,

a machine including parts-applying means for applying parts to packaging material on said machine,

a parts-supplying device including parts-supplying means, and

transferring means extending from said device to said machine and serving to transfer said parts from said device to said machine,

characterized in that said device has a clean-out track to serve in cleaning-out said parts from said device.

[0008] Owing to this aspect of the invention, it is possible to clean-out in an hygienic and automatic manner any parts remaining in the parts-supplying means when an emptying of the latter is desired.

[0009] Advantageously, the parts-supplying device is free-standing relative to the machine(s), and the transferring means comprises pneumatic transferring means. It is thus possible to obtain greater flexibility in the relative positions of the machine and the parts-supplying device. The device can be more readily accessible and of greater capacity than if it were to be mounted at the top of the machine. If desired, the device may be on the same level, i.e. the same floor, as the machine or may be at a higher or lower level than the machine, for example on a mezzanine floor above the machine.

[0010] In a preferred embodiment, a free-standing fitment sorting device supplies pour spout fitments to a form, fill and seal packaging machine from a remote, substantially ground level location. Plastics tubes, through which the pour spout fitments may be blown by compressed air, extend from the off-line sorting device to the packaging machine. The device includes a parts handling bowl which, via centrifugal force created by rotary motion, urges the pour spout fitments toward and through suitable orienting devices to orient the fitments and feed them to a track for transfer to a slide shuttle assembly co-operable with programmable cylinder or servo-driven means for further transfer via the multiple plastics tubes to placement devices which assemble the fitments in any suitable manner onto one or more sets of dual in-line cartons being indexed along conveyors of the packaging machine.

[0011] In order that the invention may be clearly and completely disclosed, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 is a perspective view of a form, fill and seal packaging machine and an associated off-line orienting and feeding device;

Figure 2 is a side elevation of the off-line orienting and feeding device;

Figure 3 is a top plan view of the device;

Figure 4 is a side elevation of a shuttle assembly of the device;

Figure 5 is a top plan view of the shuttle assembly;

Figure 6 is an end elevation of the shuttle assembly;

Figure 7 is a perspective view of a part which may

be handled by the device;

Figure 8 is a perspective view of a liquid packaging carton with that part in place thereon; and

Figure 9 is a perspective view of a plurality of form, fill and seal packaging machines and an associated off-line orienting and feeding device.

[0012] Referring now to the drawings in greater detail, Figure 1 illustrates a form, fill and seal packaging machine 10 which processes cartons, represented at 12 and shown more clearly in Figure 8. The cartons 12 are advanced through the machine in one row, or (as shown) a plurality of parallel rows, by one or more horizontal conveyors 13. A plurality of plastics tubes 14 extend to the machine 10 from an off-line orienting and feeding device 16. The machine 10 and the device 16 stand upon a floor 17 and are horizontally spaced apart. The device 16 serves to process parts in the form of identical pour spout fitments 18, of which one is shown in Figure 7.

[0013] The device 16 (Figures 1 to 3) includes a housing 20, enclosing a parts feeder unit 22 mounted on a stand 24 (Figure 2). A hopper 26 is mounted on the stand 24 so as to be located above the parts feeder unit 22, and is adapted to supply the fitments 18 via a connector member 28 to a bowl 30 of the parts feeder unit 22. Steps 32 (or alternate steps 32') at a side of the housing 20, permit an operator to fill the hopper 26 with parts, as needed, completely remote from the operating packaging machine 10. Although steps 32 or 32' are shown, it is much preferred that the operator should be able to fill the hopper 26 from ground level. Covers, represented as 33 (Figure 2), may be pivotally mounted over the hopper 26 and the bowl 30.

[0014] A track 34 (Figure 2) angles downwardly from the discharge end of the bowl 30. The bowl 30 is powered by any suitable means, causing the fitments 18 to project outwardly to encounter tracks, guide devices, rails, twists, cut-outs, air jets, or other elements (not shown) as required to cause each fitment 18 to be oriented, for example, by hanging by its flange 36 on rails, or, if incorrectly positioned, to be dropped or blown back into the bowl to be caused to return in another pass. The bowl 30 is preferably a bowl of a centrifugal parts feeder well known per se, which, via centrifugal force created by rotary motion, urges the parts 18 towards and through orienting devices to orient the parts. Alternately, the bowl 30 may be a bowl of a vibratory parts feeder well known per se, which causes the parts to travel, in response to vibration, around an upwardly spiralling track secured to the inside surface of the bowl wall, to become oriented while travelling past elements mounted along the track.

[0015] An air cylinder 38 (Figure 2) is mounted at an intermediate location along the track 34, for a purpose to be described. A slide shuttle assembly 40 (Figure 2) is positioned adjacent the exit end of the track 34. As shown in Figures 4 to 6, the slide shuttle assembly 40 includes a base 42 fixedly mounted in a portion 44 (Figure 2) of the housing 20. A plurality (four are shown) of track mounting blocks 46 are mounted in this case on a piston portion 48 of a suitable programmable air cylinder 50 (Figure 5). Each mounting block 46 has an end portion of one of the interconnecting plastic tubes 14 secured in a passage 52 formed through the block. The mounting blocks 46 are interconnected to move as a unit with the piston portion 48.

[0016] A fixed mounting block 54 (Figure 5) is secured to the base 42, and includes a passage 56 formed therethrough for receiving and confining the end portion of the fixed track 34. A pair of air manifold blocks 58 are secured to the base 42 on opposite sides of the fixed mounting block 54 and abut against the oppositely disposed side walls of the block 54. An air passage 60 is formed through the centre of each block 58, parallel to the track mounting passage 56 in the block 54. A source 62 of compressed air is connected by a line 64 to each air passage 60. Suitable valves are included in an air valve pack 66 (Figure 3) mounted in the housing 20.

[0017] As shown in Figure 3, a terminal box 68 including required relays and a controller, represented at 70, may be mounted in the housing 20, operatively connected to the programmable air cylinder 50.

[0018] A suitable fitment-detector, for example a limit switch or a photoelectric arrangement represented at 72 in Figure 1, is operatively connected to each tube 14 at a predetermined point along the height thereof within the form, fill and seal packaging machine 10. The photoelectric unit 72 causes an escapement or pick-and-placement unit, represented at 74 and as shown and described in, for example, EP-A-0819611, to be supplied with fitments 18, as required.

[0019] As illustrated in dot-dash lines in Figures 1 and 5, there may be a short tube 14' to discharge at a selected location between the device 16 and the machine 10 to serve as a clean-out chute to facilitate emptying the hopper 26 and the bowl 30 for a colour and/or product change. The tube 14' would be connected to a further mounting block 46' fixed to the blocks 46 and thus able to be brought into and out of alignment with the block 54 and one of the air passages 60.

[0020] In operation, the fitments 18 are supplied from the hopper 26 (Figure 2) to the bowl 30, where the fitments are oriented and discharged into the inlet of the track 34. As such, fitments 18 are aligned at all times in the track 34 down to the air cylinder 38.

[0021] Referring particularly to Figure 5, upon the release of fitments 18 by the air cylinder 38, the respective fitments exit from the end of the track 34, through the adjacent passage 52 of an aligned mounting block 46 into its plastic tube 14. As called for by the respective photoelectric units 72 (Figure 1) at the other end of the tubes 14, the mounting blocks 46 and their associated tube end portions are caused by the signal to and from the controller 70 (figure 3) to move to the left in Figure 5, so that the particular mounting block in question be-

comes aligned with the left-hand air passage 60. In this position, a blast of air through the passage 60 from the source 62 of compressed air sends the fitments 18 now in the adjacent tube 14, firstly downwardly to exit from the housing 20 (Figure 1), then upwardly, across the horizontal gap between the device 16 and the machine 10 at a level above the device and the machine and above any pedestrian or vehicular traffic along the gap, and down the tube past the photoelectric unit 72. Each photo-electric unit 72 includes a delay whereby parts falling past the unit do not actuate it. However, once the fitments 18 are filled to the point of stopping adjacent the unit 72, a signal therefrom stops the blowing of fitments through its particular tube 14. Then, when the line-up of fitments, which may extend well above the unit 72, drops below the unit 72 owing to the consumption thereof by the unit 74, the unit 72 signals for another batch of fitments to be released by the air cylinder 38 into the associated mounting block 46 and tube 14 moved by the programmable air cylinder 50 into alignment with one of the air passages 60. In lieu of a single delay-type photoelectric unit 72, a pair of upper and lower photoelectric units or limit switches could be used.

[0022] As may be visualized from Figure 5, the two left-hand mounting blocks 46 are moved by the programmable air cylinder 50 to the left-hand block 58, and the two right-hand mounting blocks 46 are moved by the air cylinder 50 to right-hand block 58. This has the advantage that the mounting blocks travel less distance than if there were to be only one air passage 60, and thus permits a relative increase in the output rate of the device 16.

[0023] As any of the photoelectric units 72 calls for fitments 18, the signal to the controller 70 results in signals sent to the programmable air cylinder 50 to move the mounting blocks 46 to align the correct tube 14 with the fixed block 54, and to the air cylinder 38 on the fixed track 34 to release fitments 18 thereto, and then to move to the left-hand or right-hand block 58 to be blown through the tube 14 to stack up adjacent and above the specific photoelectric unit.

[0024] If desired, and as shown in Figure 9, a single, free-standing device 16 may supply a plurality of machines 10 which may be horizontally spaced not only from the device 16 but also from each other.

[0025] It should be apparent that the off-line orienting and feeding device is practical as a free-standing sorting unit that supplies parts to one or more processing machines, with an operator being free, for example, to load the hopper or remove faulty parts from the device, at substantially ground level, without having to climb around an operating processing machine.

[0026] It should be further apparent that the off-line orienting and feeding device may handle substantially any kind of small parts, and feed them to any suitable placement device on a processing machine performing various kinds of assembly.

[0027] It should also be apparent that the enclosed tubes and compressed air blowing arrangement serve as an efficient means of transferring the small parts across convenient distances to the processing machine, without jamming or disruption therealong.

[0028] It should also be evident that any number of mounting blocks and associated tubes, instead of the four shown, may be used, depending upon the application involved. In any case, one of the tubes may be short to serve as a clean-out chute to facilitate emptying the hopper for a colour and/or product change. In addition, the plastics tubes may be directed to spaced-apart processing machines, as in Figure 9 for example, rather than to the two-line machine shown in Figure 1. Moreover, to reduce the number of long tubes used, it is possible to employ diverters in the long tubes to switch the flow of parts into short tubes leading to the or each intermediate machine 10.

[0029] It would also be possible to utilize a vacuum system in lieu of the compressed air system described.

[0030] Additionally, a high efficiency particulate air (HEPA) system could be installed in order to supply clean air to the device 16, thereby protecting the pour spout fitments from any contamination present in the production environment.

Claims

1. In combination,

at least one machine (10) including parts-applying means (74) for applying parts (18) to material (12) on said machine(s) (10),

a parts-supplying device (16) including parts-supplying means (30), and

transferring means (14) extending from said device (16) to said machine(s) (10) and serving to transfer said parts (18) from said device (16) to said machine(s) (10),

characterized in that the transferring means (14) comprises a plurality of transfer tracks (14), and said device (16)) further includes a discharge track (34) for discharging said parts (18) and a distributor (40) arranged to receive said parts (18) for said discharge track (34) and to distribute them among said transfer tracks (14).

2. A combination according to claim 1, wherein said distributor (40) comprises a slide shuttle (48).

3. A combination according to claim 2, wherein said distributor (40) further comprises fixed passage means (60), a source (62) of compressed gas for supplying said compressed gas to said passage means (60) which at times directs said gas into selected ones of said transfer tracks (14), retention means (46) attaching said transfer tracks (14) to said slide shuttle (48), and programmed drive means (50) for laterally moving said slide shuttle

(48) and thereby bringing entry ends of said transfer tracks (14) selectively into and out of alignment with said passage means (60) to cause parts (18) to be blown through said transfer tracks (14) by said compressed gas to the parts-applying means.

4. A combination according to claim 3, wherein a plurality of said transfer tracks (14) and said retention means (46) are selectively alternately moved by said programmed drive means (50) into alignment with said fixed passage means (60).

5. A combination according to any preceding claim, and further comprising parts detecting means (72) at the respective transfer tracks (14) at the or each machine (10) and arranged to signal said programmed drive means (46) when any of respective portions of the transfer tracks (14) at the machine (10) are full of parts (18).

6. A combination according to any preceding claim, wherein the or each machine (10) comprises a plurality of conveying means arranged to advance respective materials (12) and wherein the or each parts-applying means (74) comprises a plurality of parts applicators (74) associated with the respective conveying means of the machine (10).

7. A combination according to any preceding claim, wherein the or each machine (10) is a packaging machine (10).

8. A combination according to any preceding claim, wherein said device (16) further comprises a clean-out track (14') to serve in cleaning-out said parts (18) from said device (16).

9. In combination,

a machine (10) including parts-applying means (74) for applying parts (18) to packaging material (12) on said machine (10),

a parts-applying device (16) including parts-supplying means (30), and

transferring means (14) extending from said device (16) to said machine (10) and serving to transfer said parts (18) from said device (16) to said machine (10),

characterized in that said device (16) has a clean-out track (14') to serve in cleaning-out said parts (18) from said device (16).

10. A combination according to claim 9, wherein the transferring means (14) comprises a plurality of transfer tracks (14), and said device (16) further includes a discharge track (34) for discharging said parts (18) and a distributor (40) arranged to receive said parts (18) from said discharge track (34) and to distribute them to said transfer tracks (14) and said clean-out track (14').

11. A combination according to claim 10, wherein said distributor (40) comprises a slide shuttle (48), fixed passage means (60), a source (62) of compressed gas for supplying said compressed gas to said passage means (60) which at times directs said gas into selected ones of said transfer tracks (14) and said clean-out track (14'), retention means (46,46') attaching said transfer tracks (14) and said clean-out track (14') to said slide shuttle (48), and programmed drive means (50) for laterally moving said slide shuttle (48) and thereby bringing entry ends of said transfer tracks (14) and said clean-out track (14') selectively into and out of alignment with said passage means (60) to cause parts (18) to be blown through said transfer tracks (14) and said clean-out track (14') by said compressed gas.

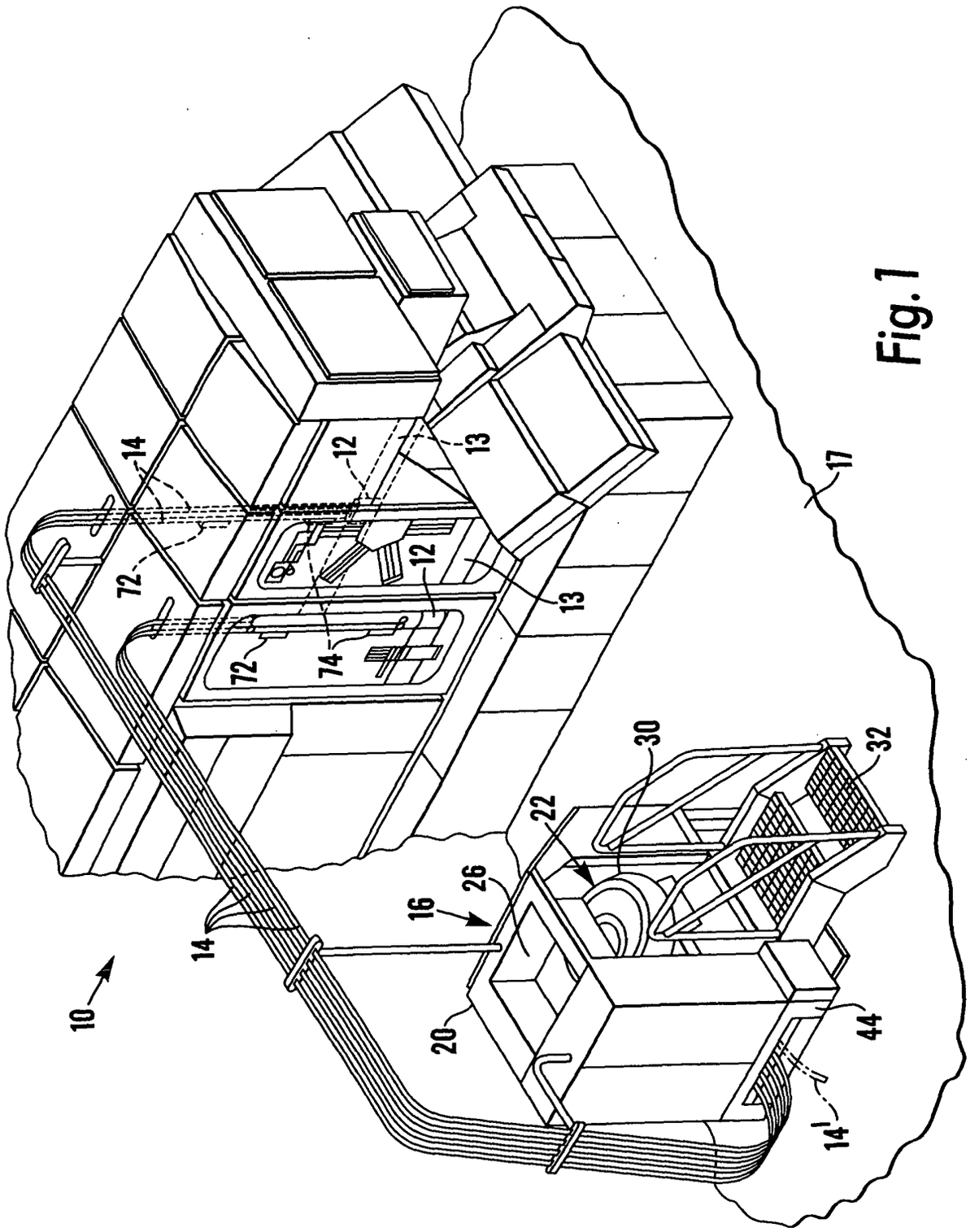

Fig. 1

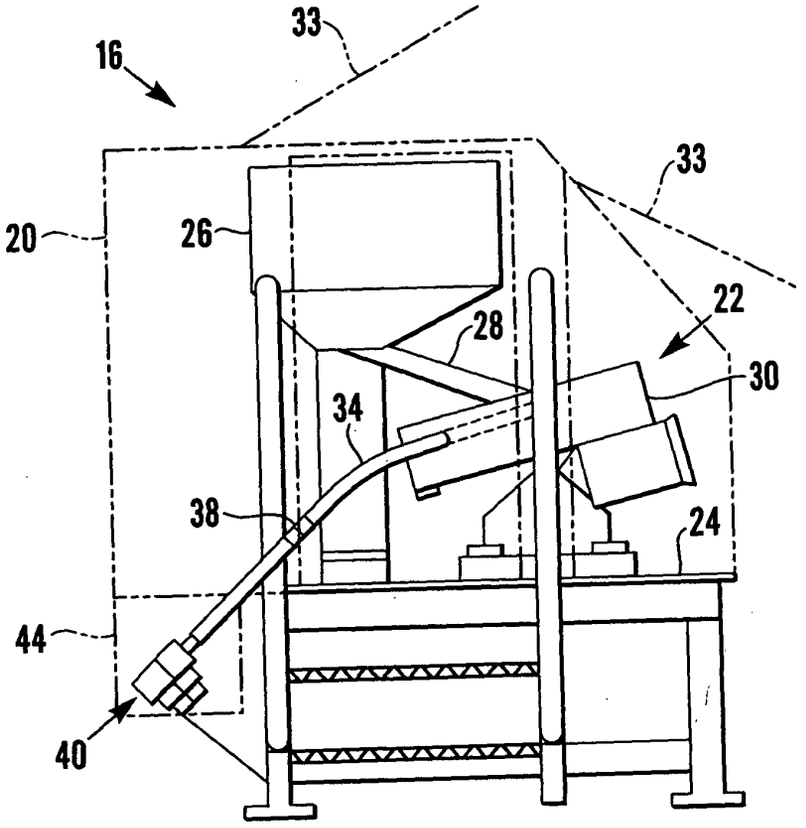

Fig.2

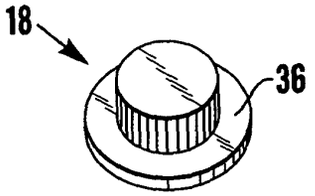

Fig.7

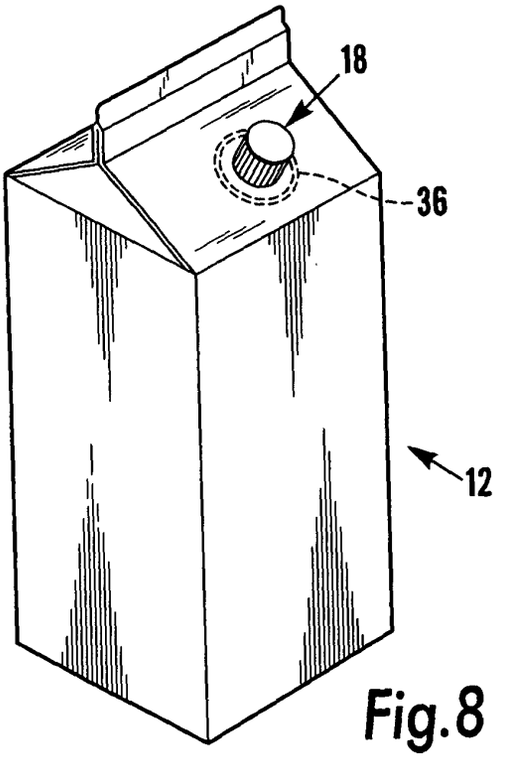

Fig.8

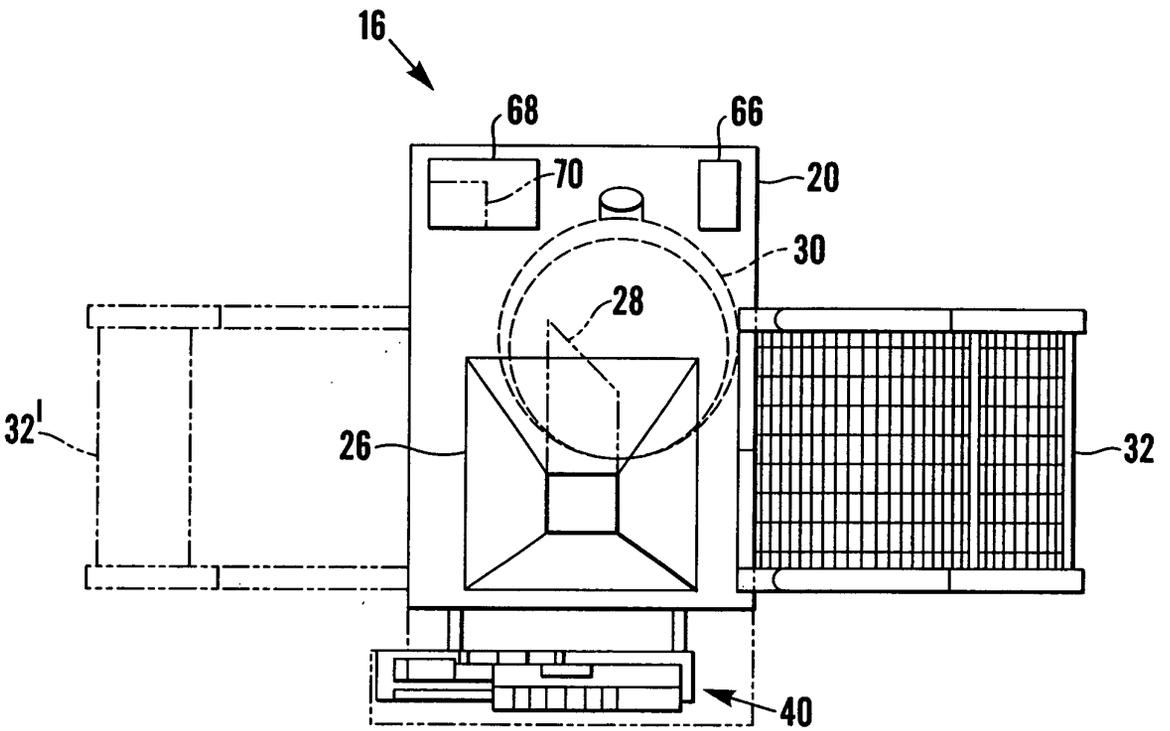

Fig.3

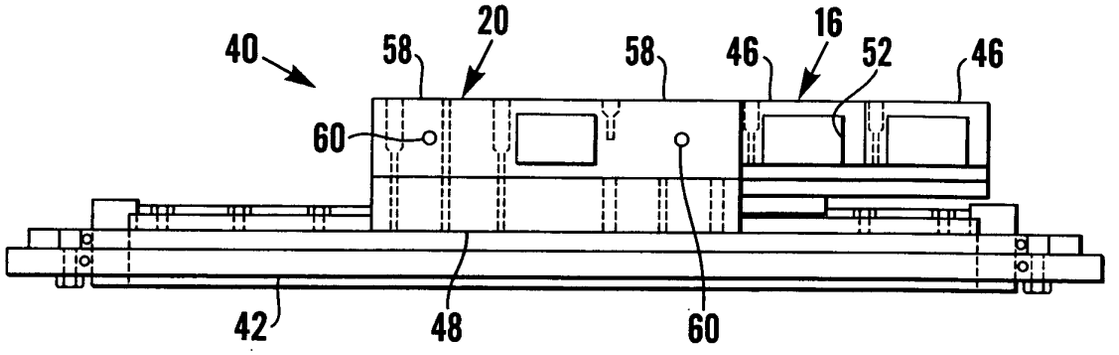

Fig.4

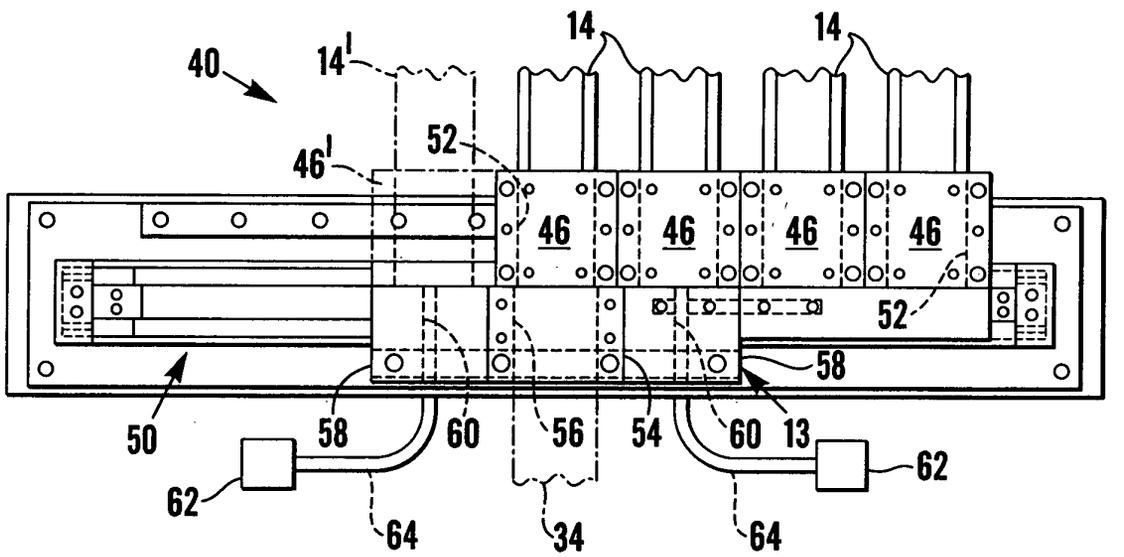

Fig.5

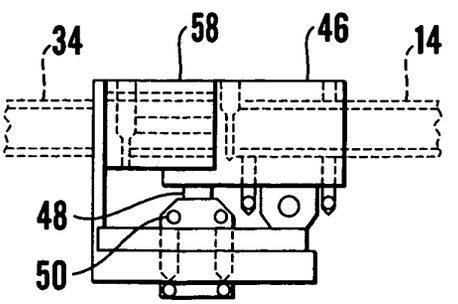

Fig.6

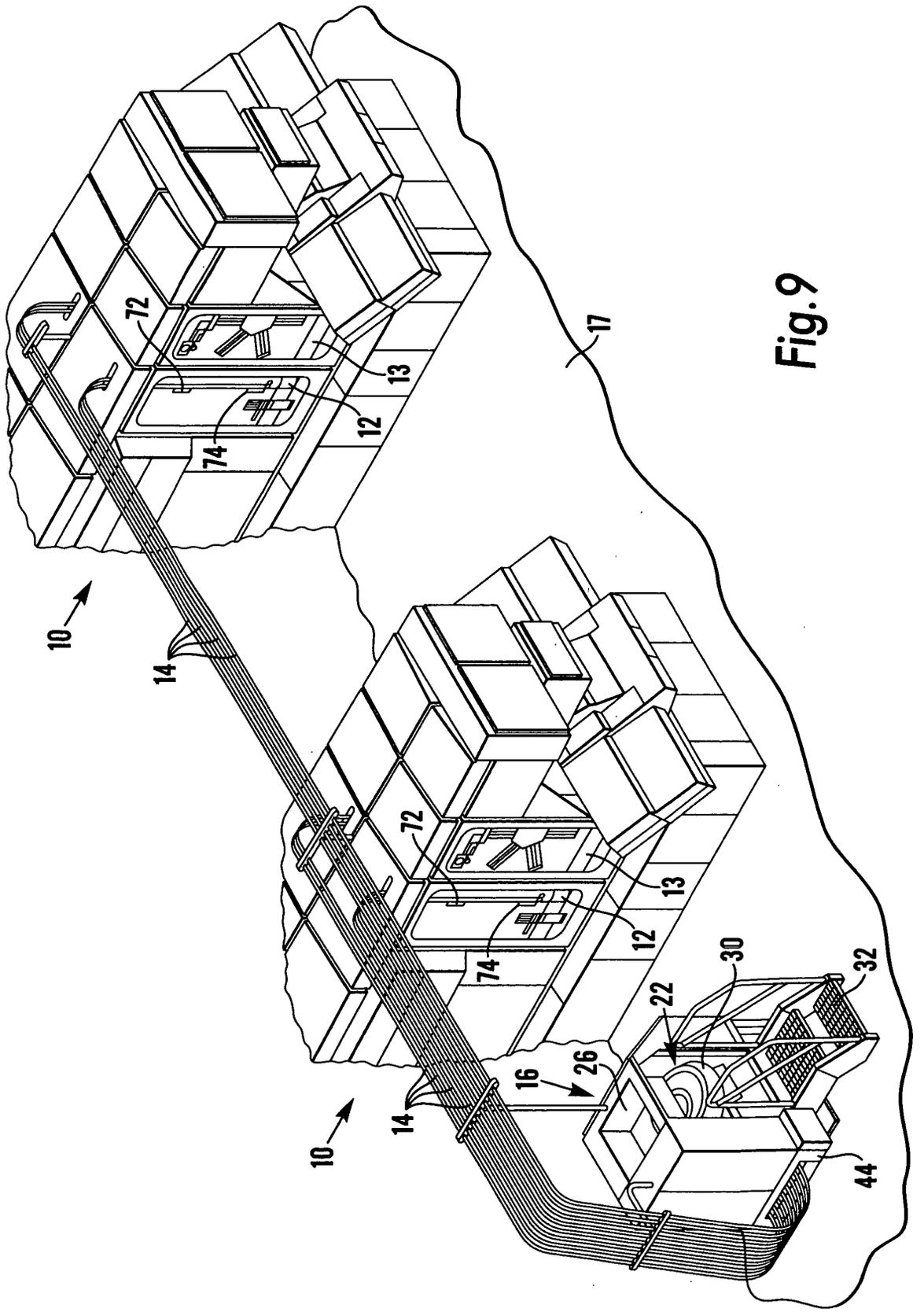

Fig.9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 02 5988

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	WO 93 02923 A (COMBIBLOC INC) 18 February 1993 (1993-02-18) * page 6, line 18 - page 12, line 20; figures *	1,6,7,9	B65B61/18 B31B1/84
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65B
B31B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 January 2003	Jagusiak, A

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 02 5988

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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