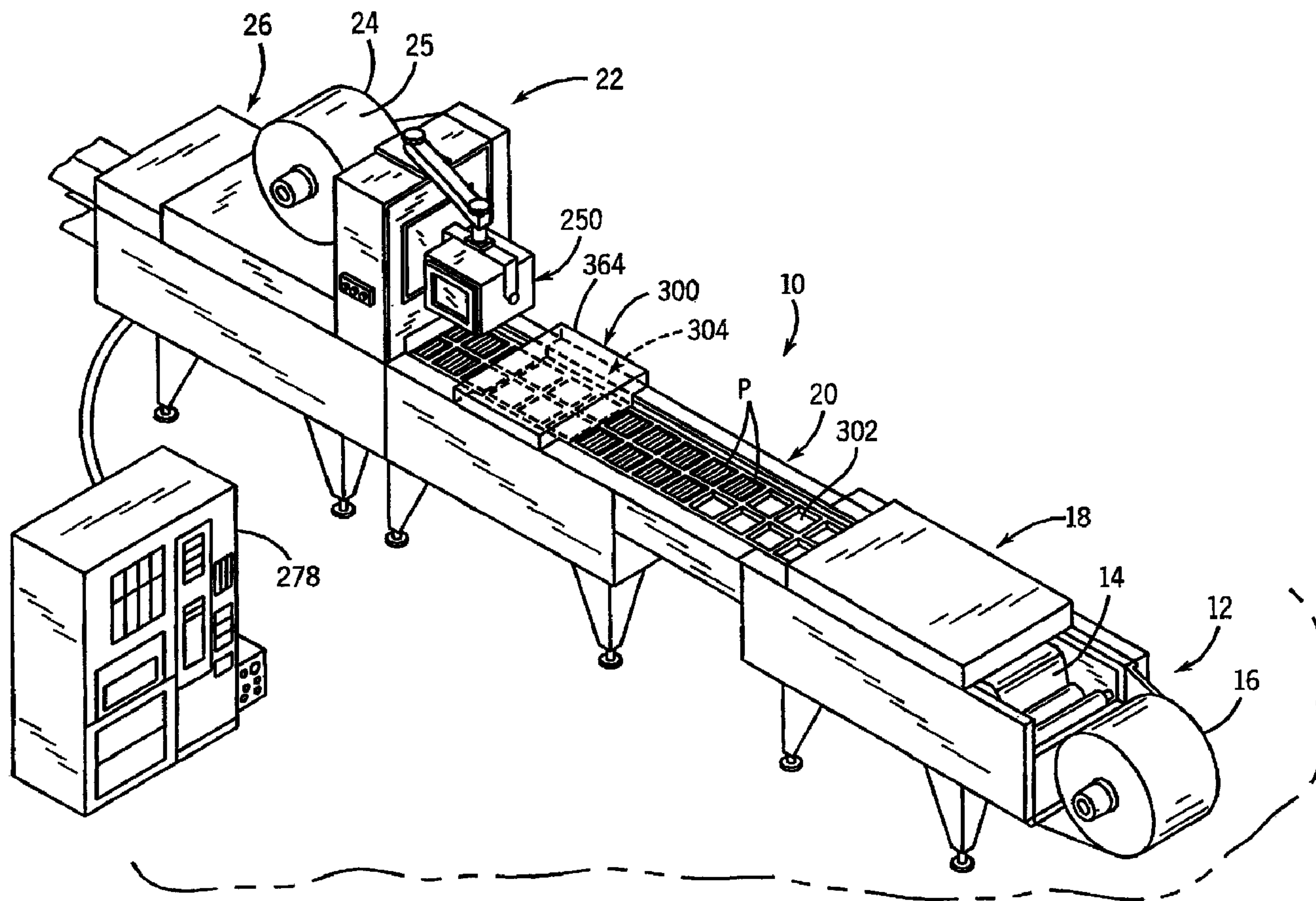




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(57) Abrégé/Abstract:
 In a web packaging machine and method packaging a food product between upper and lower webs, wherein the lower web is transported through a series of stations which form the lower web into a component of a package at a forming station, and receive

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the food product at a loading station, and close the package with the upper web at a closing station, a pasteurization station is provided between the loading station and the closing station and pasteurizing the food product.

ABSTRACT

In a web packaging machine and method packaging a food product between upper and lower webs, wherein the lower web is transported through a series of stations which form the lower web into a component of a package at a forming station, and receive the food product at a loading station, and close the package with the upper web at a closing station, a pasteurization station is provided between the loading station and the closing station and pasteurizing the food product.

WEB PACKAGING PASTEURIZATION SYSTEM

BACKGROUND

The invention relates to web packaging apparatus and methods transporting a web through a series of stations, for example forming a lower web into a component of a package receiving a food product and closed by an upper web.

Web packaging machines and methods are known in the prior art, for example U.S. Patent 5,170,611. The apparatus packages a food product between upper and lower webs. A web transport conveyor transports the lower web through a series of stations which form the lower web into a component of a package at a forming station, and receive the food product at a loading station, and close the package with the upper web at a closing station.

SUMMARY OF THE INVENTION

The present invention provides a pasteurization station pasteurizing the food product. In preferred form, the pasteurization station is between the loading station and the closing station and pasteurizes the food product in a simple effective manner readily and seamlessly incorporated into the packaging line.

According to an aspect of the invention, there is provided a packaging apparatus for packaging a food product between upper and lower webs. The apparatus comprises a web transport conveyor transporting the lower web from upstream to downstream through a series of stations receiving the food product in a lower web package at a loading station, and closing the package with the upper web at a closing station, and including a pasteurization station downstream of the loading station and upstream of the closing station and pasteurizing the food product with a pasteurizing medium injected into a pasteurization chamber through an entry port and removed from the pasteurization chamber through an exit port. The pasteurization chamber is above the lower web, and the pasteurization station includes a form-inverter below the lower web and movable upwardly to engage the underside of the lower web and push the food product upwardly into the pasteurization chamber and invert the package. The stations include a forming station upstream of the loading station and forming a downwardly depending product cavity pocket in the lower web

into which the food product is loaded. The pasteurization station comprises an upper chamber having a downwardly facing pasteurization cavity facing the product cavity pocket and pasteurizing the food product. The product cavity pocket of the lower web has a first condition at the pasteurization station, with the downwardly depending product cavity pocket having a lower central wall and a plurality of sidewalls extending upwardly therefrom. The product cavity pocket of the lower web has a second condition at the pasteurization station, with the form-inverter pushing the central wall upwardly to an upwardly pushed position with the sidewalls extending downwardly therefrom.

According to a further aspect of the invention, there is provided a packaging apparatus comprising a web transport conveyor transporting a web through a series of stations which form the web into a component of a package receiving a food product, including a pasteurization station pasteurizing the food product. The pasteurization station comprises a chamber having a first set of one or more ports and a second set of one or more ports. The first set of one or more ports introduces a pasteurizing medium, the second set of one or more ports vents the pasteurizing medium such that the pasteurizing medium flows across the food product between the first and second sets of ports.

Additionally, one aspect of the invention provides a packaging apparatus comprising a web transport conveyor transporting a web through a series of stations which form the web into a component of a package receiving a food product. In this aspect, the apparatus includes a pasteurization station pasteurizing the food product, the pasteurization station having a first set of one or more ports introducing pasteurizing medium for flow across the food product from a first end of the food product. The pasteurization station has a second set of one or more ports spaced from the first set of one or more ports and introduces pasteurizing medium for flow across the food product from a second distally opposite end of the food product.

Further, an aspect of the invention provides a packaging apparatus comprising a web transport conveyor transporting a web through a series of stations which form the web into a component of a package receiving a food product, including a pasteurization station pasteurizing the food product. The pasteurization station has a pasteurization cycle alternating between first and second modes

providing alternating flow direction of the pasteurizing medium across the food product. In the first mode, the pasteurizing medium is introduced through a first set of one or more ports, and in the second mode the pasteurizing medium is introduced through a second set of one or more ports, to alternate the flow direction of the pasteurizing medium across the food product.

Further, an aspect of the invention provides a packaging apparatus comprising a web transport conveyor transporting a web through a series of stations which form the web into a component of a package receiving a food product. In this aspect, the apparatus includes a pasteurization station pasteurizing the food product. The pasteurization station comprises a module having a pair of side by side chambers, comprising a first chamber having a first set of one or more ports and a second set of one or more ports, and a second chamber having a third set of one or more ports and a fourth set of one or more ports. The module comprises first, second and third flow passages. The first flow passage communicates with the first and third sets of one or more ports, the second flow passage communicates with the second set of one or more ports, and the third flow passage communicates with the fourth set of one or more ports.

Further, an aspect of the invention provides a packaging apparatus comprising a web transport conveyor transporting a web through a series of stations which form the web into a component of a package receiving a food product, including a pasteurization station pasteurizing the food product. The pasteurization station pasteurizes the food product with a pasteurizing medium comprising steam. The pasteurization station comprises a chamber having a first set of one or more ports introducing the steam and a second set of one or more ports at a gravitationally low section of the chamber and discharges liquid condensate from the steam.

Further, an aspect of the invention provides a packaging apparatus packaging a food product between upper and lower webs, comprising a web transport conveyor transporting the lower web from upstream to downstream through a series of stations receiving the food product in a lower web package at a loading station, and closing the package with the upper web at a closing station, and including a pasteurization station downstream of the loading station and upstream of the closing station and pasteurizing the food product with a pasteurizing medium injected into a

pasteurization chamber through an entry port and removed from the pasteurization chamber through an exit port. The exit port is separate from and spaced from the entry port, such that the pasteurizing medium enters the chamber at a first location at the entry port and pasteurizes the food product and exits the chamber at a second different location at the exit port.

Further, an aspect of the invention provides a packaging apparatus packaging a food product between upper and lower webs, comprising a web transport conveyor transporting the lower web from upstream to downstream through a series of stations receiving the food product in a lower web package at a loading station, and closing the package with the upper web at a closing station, and including a pasteurization station downstream of the loading station and upstream of the closing station and pasteurizing the food product with a pasteurizing medium injected into a pasteurization chamber through an entry port and removed from the pasteurization chamber through an exit port. The pasteurization station comprises an upper chamber having a downwardly facing pasteurization cavity facing the food product without the upper web therebetween.

Further, an aspect of the invention provides a packaging apparatus packaging a food product between upper and lower webs, comprising a web transport conveyor transporting the lower web from upstream to downstream through a series of stations receiving the food product in a lower web package at a loading station, and closing the package with the upper web at a closing station, and including a pasteurization station downstream of the loading station and upstream of the closing station and pasteurizing the food product with a pasteurizing medium injected into a pasteurization chamber through an entry port and removed from the pasteurization chamber through an exit port. The pasteurization station includes a lower chamber below the lower web and an upper chamber above the lower web and has a downwardly facing pasteurization cavity facing the food product. One of the upper and lower chambers is movable toward the other of the upper and lower chambers to form a pressure-containing vessel enclosing the pasteurization cavity and sealed along its periphery by a portion of the lower web engaged between the chambers without the upper web therebetween. The pasteurizing medium passes into and out of the

pasteurization cavity without passing through the interface between the upper and lower webs.

Further, an aspect of the invention provides a method for packaging a food product comprising providing a web transport conveyor and transporting a web through a series of stations and forming the web into a component of a package receiving a food product, providing a pasteurization station with a pasteurization chamber having a first set of one or more ports and a second set of one or more ports, pasteurizing the food product with a pasteurization cycle having first and second modes. In the first mode pasteurizing medium is introduced from the first set of one or more ports, and in the second mode pasteurizing medium is introduced from the second set of one or more ports. The pasteurization cycle alternates between first and second modes.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an isometric view of web packaging apparatus in accordance with the invention.

Fig. 2 is a side view partially cut away of a portion of the apparatus of Fig. 1.

Fig. 3 is a view taken along line 3-3 of Fig. 2.

Fig. 4 is like Fig. 3 and illustrates sequential operation.

Fig. 5 is a view taken along line 5-5 of Fig. 4.

Fig. 6 is an enlarged view of a portion of Fig. 4.

Fig. 7 is like Fig. 6 and illustrates sequential operation.

Fig. 8 is an exploded isometric view partially folded away of a portion of the structure of Fig. 6.

Fig. 9 is an isometric view of a portion of Fig. 3.

Fig. 10 is like Fig. 9 and illustrates sequential operation.

DETAILED DESCRIPTION

The packaging apparatus comprises a web transport conveyor transporting a web through a series of stations which form the web into a component of a package receiving a food product.

The stations of the packaging apparatus may include a pasteurization station for pasteurizing the product, a forming station forming a downwardly depending product cavity pocket in the web into which the food product is loaded. The pasteurization station may comprise an upper chamber having a downwardly facing pasteurization cavity facing the product cavity pocket, for pasteurizing the food product. In this instance, the web may advance from upstream to downstream; and the pasteurization station is downstream of the forming station. Further, the food product may be loaded into the product cavity pocket at a loading station; the loading station being downstream of the forming station; and pasteurization station being downstream of the loading station.

The pasteurization station of the packaging apparatus may include a lower chamber below the web, and one of the upper and lower chambers may be moveable toward the other of the upper and lower chambers to form a pressure-containing vessel. In such an instance, the pressure-containing vessel encloses the pasteurization cavity, and may be sealed along its periphery by a portion of the web engaged between the chambers.

The upper chamber of the packaging apparatus may be located above the web, and in such instance, the pasteurization station may include a form-inverter below the web. The form-inverter may be movable upwardly to engage the underside of the web so as to be able to push the food product upwardly into the upper chamber.

The product cavity pocket of the web may have a first condition at the pasteurization station, with the downwardly depending product cavity pocket having a lower central wall and a plurality of sidewalls extending upwardly therefrom. The product cavity pocket of the web may also have a second condition at the pasteurization station, with the form-inverter pushing the central wall upwardly to an upwardly pushed position with the sidewalls extending downwardly therefrom.

The form-inverter may have an upper central wall and a plurality of sidewalls extending downwardly therefrom. In such an instance, the product cavity pocket in the second condition is draped over and supported by the form-inverter, with the central wall of the product cavity pocket being on the central wall of the

form-inverter, and the sidewalls of the product cavity pocket extending along the sidewalls of the form-inverter.

In an embodiment of the packaging apparatus according the invention, the upper chamber may have an upper central wall and a plurality of sidewalls extending downwardly therefrom.. When the product cavity pocket is in the first condition, noted above, the food product is supported on the central wall of the product cavity pocket and laterally retained by the sidewalls of the product cavity pocket. When the product cavity pocket is in the second condition, the food product is supported on the central wall of the product cavity pocket and is laterally retained by the sidewalls of the upper chamber.

The pasteurization station of the packaging apparatus may optionally comprises a chamber having a first set of one or more ports, and a second set of one or more ports. The first set of one or more ports introduces a pasteurizing medium, and the second set of one or more ports vents the pasteurizing medium such that the pasteurizing medium flows across the food product between the first and the second sets of ports.

The pasteurization station itself may optionally have a first set of one or more ports introducing a pasteurizing medium for flow across the food product from a first end thereof, and a second set of one or more ports spaced from the first set of one or more ports, and pasteurizing medium is introduced for flow across the food product from a second distally opposite end thereof. In this instance, the pasteurizing medium is introduced simultaneously from both the first and second sets of ports to simultaneously flow across the food product from each of the first and second distally opposite ends.

The pasteurization station may optionally have a pasteurization cycle alternating between first and second modes providing alternating flow direction of a pasteurizing medium across the food product. In the first mode, the pasteurizing medium is introduced through a first set of one or more ports, and in the second mode the pasteurizing medium is introduced through a second set of one or more ports, to alternate flow direction of the pasteurizing medium across the food product.

The pasteurization station may comprise a module having a pair of side by side chambers. In this case, there is provided a first chamber having a first set of

one or more ports, and a second set of one or more ports, and a second chamber having a third set of one or more ports, and a fourth set of one or more ports. The module may comprise first, second and third flow passages, wherein the first flow passage communicates with the first and third sets of one or more ports, the second flow passage communicates with the second set of one or more ports, and the third flow passage communicates with the fourth set of one or more ports. In this instance, the pasteurization station may also have a pasteurization cycle alternating between first and second modes to provide alternating flow direction of a pasteurizing medium across the food product in each of the first and second chambers. In the first mode, the pasteurizing medium is introduced through the first flow passage, and in the second mode the pasteurizing medium is introduced through the second and third flow passages.

As an example, the pasteurization station may pasteurize the food product with a pasteurizing medium such as steam. In that case, the pasteurization station may comprise a chamber having a first set of one or more ports introducing steam, and a second set of one or more ports at a gravitationally low section of the chamber, from which liquid condensate from steam is discharged. Optionally, the second set of one or more ports also vent steam. As a further option, a third set of one or more ports may vent steam.

According to a further aspect of the invention, there is provided a packaging apparatus for packaging a food product between upper and lower webs. This apparatus comprises a web transport conveyor which transports the lower web through a series of stations which form the lower web into a component of a package at a forming station, and which receives the food product at a loading station. The package may be closed with the upper web at a closing station. The stations may include a pasteurization station located between the loading station and the closing station, and a pasteurizing station for pasteurizing the food product. In this instance, the conveyor may advance from upstream to downstream. Additionally, the closing station may be located downstream of the pasteurization station; the pasteurization station may be downstream of the loading station; and the loading station may be downstream of the forming station.

Additionally, the forming station may form a downwardly depending product cavity pocket in the lower web into which the food product is loaded. The pasteurization station may comprise an upper chamber having a downwardly facing pasteurization cavity facing the product cavity pocket and pasteurizing the food product. The food product may be loaded into the product cavity pocket at the loading station. In this instance, the upper chamber may be located above the lower web, the pasteurization station may further include a form-inverter below the lower web and is movable upwardly so as to engage the underside of the lower web and push the food product upwardly into the upper chamber. Additionally, the product cavity pocket of the lower web may have a first condition at the pasteurization station wherein the downwardly depending product cavity pocket has a lower central wall and a plurality of sidewalls extending upwardly therefrom.

The product cavity pocket of the lower web may have a second condition at the pasteurization station wherein the form-inverter pushes the central wall upwardly to an upwardly pushed position with the sidewalls extending downwardly therefrom. The upper chamber may have a first set of one or more ports, and a second set of one or more ports. The first set of one or more ports may introduce a pasteurizing medium, while the second set of one or more ports may evacuate the pasteurizing medium so that the pasteurizing medium flows across the food product between the first and second sets of ports.

According to another aspect of the invention, there is provided a method for packaging a food product comprising the steps of providing a web transport conveyor, transporting a web through a series of stations, forming the web into a component of a package receiving a food product, and providing a pasteurization station and pasteurizing the food product. Optionally, the food product may be pasteurized while in the package. In this instance, further steps may be undertaken, such as forming a product cavity pocket in the web to provide an initial condition of the package, loading the food product into the package, inverting the package to better expose the food product. These steps may be followed by pasteurization of the food product and then re-inverting the package to the initial condition.

The method may optionally comprise packaging the food product in a package formed by upper and lower webs. Further, a forming station may be provided, forming a downwardly depending product cavity pocket in the lower. Optionally, the food product may be loaded into the product cavity pocket, after which pasteurization of the food product may occur, followed by closing of the package with the upper web. A pasteurization station may be provided, having an upper chamber with a downwardly facing pasteurization cavity facing the product cavity pocket.

The food product may be pushed upwardly into the pasteurization cavity and may be pasteurized therein. Additionally, a pasteurization station may be included, having a pasteurization chamber having a first set of one or more ports, and a second set of one or more ports. The food product may be pasteurized with a pasteurization cycle having first and second modes, comprising in the first mode introducing that pasteurizing medium from the first set of one or more ports, and in the second mode introducing the pasteurizing medium from the second set of one or more ports. During the pasteurization cycle, it may be desirable to alternate between the first and second modes.

Fig. 1 illustrates a packaging machine 10 and is like Fig. 1 of U.S. Patent 5,170,611 and uses like reference numerals therefrom where appropriate to facilitate understanding. As noted in the '611 patent, packaging machine 10 generally includes a lower web supply station 12 for supplying a lower web 14 of flexible packaging material from a supply roll 16, a forming station 18, a loading station 20, an upper web supply station 22 for supplying an upper web of flexible packaging material 25, and a downstream station 26 closing the package. As described in the '611 patent, the web transport conveyor provided by machine 10 transports lower web 14 through the noted series of stations which form the lower web into a component of a package at forming station 18, and receive the food product such as hot dogs P at loading station 20, and close the package with the upper web 25 at closing station 26. The webs are advanced by the indexing apparatus disclosed in the '611 patent, as controlled by the control modules 250 and 278, also as set forth in the '611 patent, to which further reference may be had. The conveyor advances from upstream to downstream, wherein closing station

26 is downstream of loading station 20, and loading station 20 is downstream of forming station 18.

The present invention provides a pasteurization station 300 pasteurizing food product P. Pasteurization station 300 is between loading station 20 and closing station 26. Pasteurization station 300 is downstream of loading station 20, and is upstream of closing station 26. Forming station 18 forms a downwardly depending product cavity pocket 302, Figs. 1, 9, 3, in lower web 14 into which food product P is loaded, in accordance with the noted '611 patent. Pasteurization station 300 includes an upper chamber 304, Fig. 8, having a downwardly facing pasteurization cavity 306 facing product cavity pocket 302, Fig. 3, and pasteurizing food product P, to be described. Upper chamber 304 is above web 14. The pasteurization station includes a lower chamber 307 preferably provided by a form-inverter 308, Figs. 8, 3, below the web and movable upwardly, Fig. 4, to engage the underside of web 14 and push food product P upwardly into pasteurization cavity 306 in upper chamber 304. Form-inverter 308 is preferably moved upwardly and downwardly by servo motors

comparably to those used in the '611 patent for raising and lowering the forming box at forming station 18 for forming the noted product cavity pocket, for example as shown in Figs. 2, 4, 5 of the '611 patent. Servo motors 310, 312, Fig. 2, rotate respective shafts 314, 316 which in turn rotate respective lift arms 318 and 320 from the lower position shown in dashed line in Fig. 2 to the upper position shown in solid line in Fig. 2 to in turn move form-inverter 308 upwardly as shown at arrows 322, 324, comparably to the upward movement provided by lift arms 128 and 216 in Figs. 2 and 5 of the '611 patent. Roller members 326, 328 at the ends of respective arms 318, 320 roll along respective cam slots 330, 332 along the underside of form-inverter 308 comparably to roller member 132 in Fig. 5 of the '611 patent rolling along cam slot 134. The form-inverter is guided for up-down reciprocal movement by plastic bearing blocks 334, 336 sliding along vertical guides 338, 340 of frame 12, comparably to plastic bearing blocks 140 and guides 144 of the '611 patent. Upper and lower chambers 304 and 307 mate, Figs. 4-7, to form a pressure-containing vessel enclosing cavity 306 sealed along its periphery in gasket-like manner by web 14 engaged between members 304 and 307 as shown at portion 341.

Product cavity pocket 302 of web 14 has a first condition, Figs. 9, 3, at pasteurization station 300, with the downwardly depending product cavity pocket 302 having a lower central wall 342 and a plurality of sidewalls 344 extending upwardly therefrom. Product cavity pocket 302 has a second condition, Figs. 10, 4, at the pasteurization station, with form-inverter 308 pushing central wall 342 upwardly to an upwardly pushed position, Fig. 10, with sidewalls 344 extending downwardly therefrom. Form-inverter 308 has an upper central wall 346, Fig. 9, and a plurality of sidewalls 348 extending downwardly therefrom. Product cavity pocket 302 in the noted second condition, Fig. 10, is draped over and supported by form-inverter 308, with central wall 342 on central wall 346, and sidewalls 344 extending along sidewalls 348. Product cavity pocket 302 has an initial condition as shown in Fig. 9 receiving food product P therein. The package is inverted as shown in Fig. 10 to better expose food product P for pasteurization. Upper chamber 304 has an upper central wall 350, Fig. 8, and a plurality of sidewalls 352 extending downwardly

therefrom. In the noted first condition, Figs. 9, 3, of product cavity pocket 302, food product P is supported on central wall 342 of the product cavity pocket and retained by sidewalls 344 of the product cavity pocket. In the noted second condition, Figs. 10, 4, 5, of product cavity pocket 302, food product P is supported on central wall 342 of the product cavity pocket and laterally retained by sidewalls 352 of upper chamber 304.

Pasteurization chamber 304, Fig. 6, has a set of one or more ports 354, and a set of one or more ports 356. Ports 354 introduce a pasteurizing medium, preferably steam, and ports 356 evacuate and vent the pasteurizing medium, such that the pasteurizing medium flows across food product P as shown at arrow 358 between ports 354 and 356. Ports 356 are at a gravitationally low section of pasteurization cavity 306 and also preferably discharge liquid condensate from the steam. Steam may be additionally or alternatively evacuated and vented at another set of one or more ports 360. In preferred form, pasteurization station 300 has a pasteurization cycle alternating between first and second modes providing alternating flow direction of the pasteurizing medium, preferably steam, across food product P. In the first mode, steam is introduced through ports 354, and in the second mode the steam is introduced through ports 360. In the first mode, the steam may be vented through ports 356 and/or ports 360. In the second mode, the steam may be vented through ports 356 and/or ports 354, the latter venting being shown at arrow 362 in Fig. 7. In another embodiment, steam is introduced simultaneously from both sets of ports 354 and 360. Pressure and/or temperature sensing is provided at pressure and/or temperature transducer ports 361, 363, for monitoring purposes and better process control if desired.

In one preferred embodiment, the pasteurization station is provided by a module 364, Figs. 1, 8, having at least a pair of laterally spaced side by side chambers 304 and 366, Fig. 6, and further preferably a plurality of such pairs, for example one each of which is shown in Fig. 8 at 304, 368, 370 in series along the direction of web transport. The other chamber of each pair has a like set of ports; for example chamber 366, Fig. 6, has a set of one or more ports 372 and another set of

one or more ports 374 and may have a further set of one or more ports 376. The pasteurization station may include one or more modules 364. Each module 364 has flow passages 378, 380, 382, and may have further flow passages 384 and 386. During the first mode of the pasteurization cycle, Fig. 6, steam is introduced through flow passage 378 and ports 354 and 372 into respective chambers 304 and 366 and is vented through respective ports 356 and 374 through respective flow passages 380 and 382, and may additionally or alternatively be vented through respective ports 360 and 376 through respective flow passages 384 and 386. Liquid condensate from the steam is discharged through respective ports 356 and 374 through respective passages 380 and 382. During the second mode of the pasteurization cycle, Fig. 7, steam is introduced through flow passages 384 and 386 and respective ports 360 and 376 into respective chamber 304 and 366, and is vented at respective ports 356 and 374 through respective passages 380 and 382 and may additionally or alternatively be vented at ports 354 and 372 through flow passage 378. Upon completion of pasteurization, the package is re-inverted to its noted initial condition, Fig. 9, by lowering form-inverter 308. The package is then advanced and closed with the upper web 25 at closing station 26 as in the noted '611 patent.

It is recognized that various equivalents, alternatives and modifications are possible within the scope of the appended claims. The term pasteurization is used herein in accordance with its normal dictionary definition, including partial sterilization of a substance at a temperature and for a period of exposure that destroys objectionable organisms without major chemical alteration of the substance, and including destruction of pathogenic and/or spoilage organisms for extending shelf life. The invention may be used with various web packaging apparatus known in the prior art, including continuous motion type web packaging machines and indexing type web packaging machines. It is preferred that plural packages of food product be simultaneously processed at the pasteurization station, Figs. 8-10, though the invention is not limited to any particular number, i.e. the invention includes the pasteurization of one or more product packages. Furthermore, additional pasteurization stations may be added, and the invention includes one or more

pasteurization stations, each having one or more pasteurization chambers. Food product inversion is preferred, e.g. via form-inverter 308, but is not necessary, and may be deleted if desired. The pasteurizing medium is preferably steam, or alternatively hot air or superheated steam, though other types of pasteurizing media may be used.

CLAIMS:

1. A packaging apparatus comprising a web transport conveyor transporting a web through a series of stations which form the web into a component of a package receiving a food product, including a pasteurization station pasteurizing said food product, said pasteurization station comprising a chamber having a first set of one or more ports and a second set of one or more ports, said first set of one or more ports introducing a pasteurizing medium, said second set of one or more ports venting said pasteurizing medium such that said pasteurizing medium flows across said food product between said first and second sets of ports, and wherein the pasteurizing medium does not flow through the web.

2. A packaging apparatus comprising a web transport conveyor transporting a web through a series of stations which form the web into a component of a package receiving a food product, including a pasteurization station pasteurizing said food product, said pasteurization station having a first set of one or more ports introducing pasteurizing medium for flow across said food product from a first end of said food product, said pasteurization station having a second set of one or more ports spaced from said first set of one or more ports and introducing pasteurizing medium for flow across said food product from a second distally opposite end of said food product.

3. The packaging apparatus according to claim 2 wherein said pasteurizing medium is introduced simultaneously from both of said first and second sets of ports to simultaneously flow across said food product from each of said first and second distally opposite ends of said food product.

4. A packaging apparatus comprising a web transport conveyor transporting a web through a series of stations which form the web into a component of a package receiving a food product, including a pasteurization station pasteurizing said food product, said pasteurization station having a pasteurization cycle alternating between first and second modes providing alternating flow direction of said pasteurizing medium across said food product, wherein in said first mode said pasteurizing

medium is introduced through a first set of one or more ports, and in said second mode said pasteurizing medium is introduced through a second set of one or more ports, to alternate said flow direction of said pasteurizing medium across said food product.

5. A packaging apparatus comprising a web transport conveyor transporting a web through a series of stations which form the web into a component of a package receiving a food product, including a pasteurization station pasteurizing said food product, said pasteurization station comprising a module having a pair of side by side chambers, comprising a first chamber having a first set of one or more ports and a second set of one or more ports, and a second chamber having a third set of one or more ports and a fourth set of one or more ports, said module comprising first, second and third flow passages, said first flow passage communicating with said first and third sets of one or more ports, said second flow passage communicating with said second set of one or more ports, said third flow passage communicating with said fourth set of one or more ports.

6. The packaging apparatus according to claim 5 wherein said pasteurization station has a pasteurization cycle alternating between first and second modes providing alternating flow direction of a pasteurizing medium across said food product in each of said first and second chambers, wherein in said first mode said pasteurizing medium is introduced through said first flow passage to said first and third sets of one or more ports, and in said second mode said pasteurizing medium is introduced through said second and third flow passages to said second and fourth sets of one or more ports, respectively.

7. A packaging apparatus comprising a web transport conveyor transporting a web through a series of stations which form the web into a component of a package receiving a food product, including a pasteurization station pasteurizing said food product, said pasteurization station pasteurizing said food product with a pasteurizing medium comprising steam, said pasteurization station comprising a chamber having a first set of one or more ports introducing said steam and a second set of one or more

ports at a gravitationally low section of said chamber and discharging liquid condensate from said steam, and wherein the pasteurizing medium does not flow through the web.

8. The packaging apparatus according to claim 7 wherein said second set of one or more ports also vent said steam.

9. The packaging apparatus according to claim 7 comprising a third set of one or more ports venting said steam.

10. A packaging apparatus packaging a food product between upper and lower webs, comprising a web transport conveyor transporting said lower web from upstream to downstream through a series of stations receiving the food product in a lower web package at a loading station, and closing the package with the upper web at a closing station, and including a pasteurization station downstream of said loading station and upstream of said closing station and pasteurizing the food product with a pasteurizing medium injected into a pasteurization chamber through an entry port and removed from said pasteurization chamber through an exit port, said exit port being separate from and spaced from said entry port, such that said pasteurizing medium enters said chamber at a first location at said entry port and pasteurizes said food product and exits said chamber at a second different location at said exit port, and wherein the pasteurizing medium does not flow through the lower web and does not flow through the upper web.

11. A packaging apparatus packaging a food product between upper and lower webs, comprising a web transport conveyor transporting said lower web from upstream to downstream through a series of stations receiving the food product in a lower web package at a loading station, and closing the package with the upper web at a closing station, and including a pasteurization station downstream of said loading station and upstream of said closing station and pasteurizing the food product with a pasteurizing medium injected into a pasteurization chamber through an entry port and removed from said pasteurization chamber through an exit port, said pasteurization

station comprising an upper chamber having a downwardly facing pasteurization cavity facing the food product without said upper web therebetween.

12. A packaging apparatus packaging a food product between upper and lower webs, comprising a web transport conveyor transporting said lower web from upstream to downstream through a series of stations receiving the food product in a lower web package at a loading station, and closing the package with the upper web at a closing station, and including a pasteurization station downstream of said loading station and upstream of said closing station and pasteurizing the food product with a pasteurizing medium injected into a pasteurization chamber through an entry port and removed from said pasteurization chamber through an exit port, said pasteurization station including a lower chamber below said lower web and an upper chamber above said lower web and having a downwardly facing pasteurization cavity facing the food product, one of said upper and lower chambers being movable toward the other of said upper and lower chambers to form a pressure-containing vessel enclosing said pasteurization cavity and sealed along its periphery by a portion of said lower web engaged between said chambers without said upper web therebetween, said pasteurizing medium passing into and out of said pasteurization cavity without passing through the interface between said upper and lower webs.

13. A method for packaging a food product comprising providing a web transport conveyor and transporting a web through a series of stations and forming the web into a component of a package receiving a food product, providing a pasteurization station with a pasteurization chamber having a first set of one or more ports and a second set of one or more ports, pasteurizing said food product with a pasteurization cycle having first and second modes, comprising in said first mode introducing pasteurizing medium from said first set of one or more ports, and in said second mode introducing pasteurizing medium from said second set of one or more ports, and comprising alternating between first and second modes during said pasteurization cycle.

14. The packaging apparatus according to any one of claims 10 to 12, wherein said pasteurization chamber is above said lower web, and said pasteurization station

includes a form-inverter below said lower web and movable upwardly to engage the underside of said lower web and push said food product upwardly into said pasteurization chamber and invert said package, and wherein:

said stations include a forming station upstream of said loading station and forming a downwardly depending product cavity pocket in said lower web into which said food product is loaded;

said pasteurization station comprises an upper chamber having a downwardly facing pasteurization cavity facing said product cavity pocket and pasteurizing said food product;

said product cavity pocket of said lower web has a first condition at said pasteurization station, with said downwardly depending product cavity pocket having a lower central wall and a plurality of sidewalls extending upwardly therefrom;

said product cavity pocket of said lower web has a second condition at said pasteurization station, with said form-inverter pushing said central wall upwardly to an upwardly pushed position with said sidewalls extending downwardly therefrom.

15. The packaging apparatus according to claim 14 wherein:

said form-inverter has an upper central wall and a plurality of sidewalls extending downwardly therefrom;

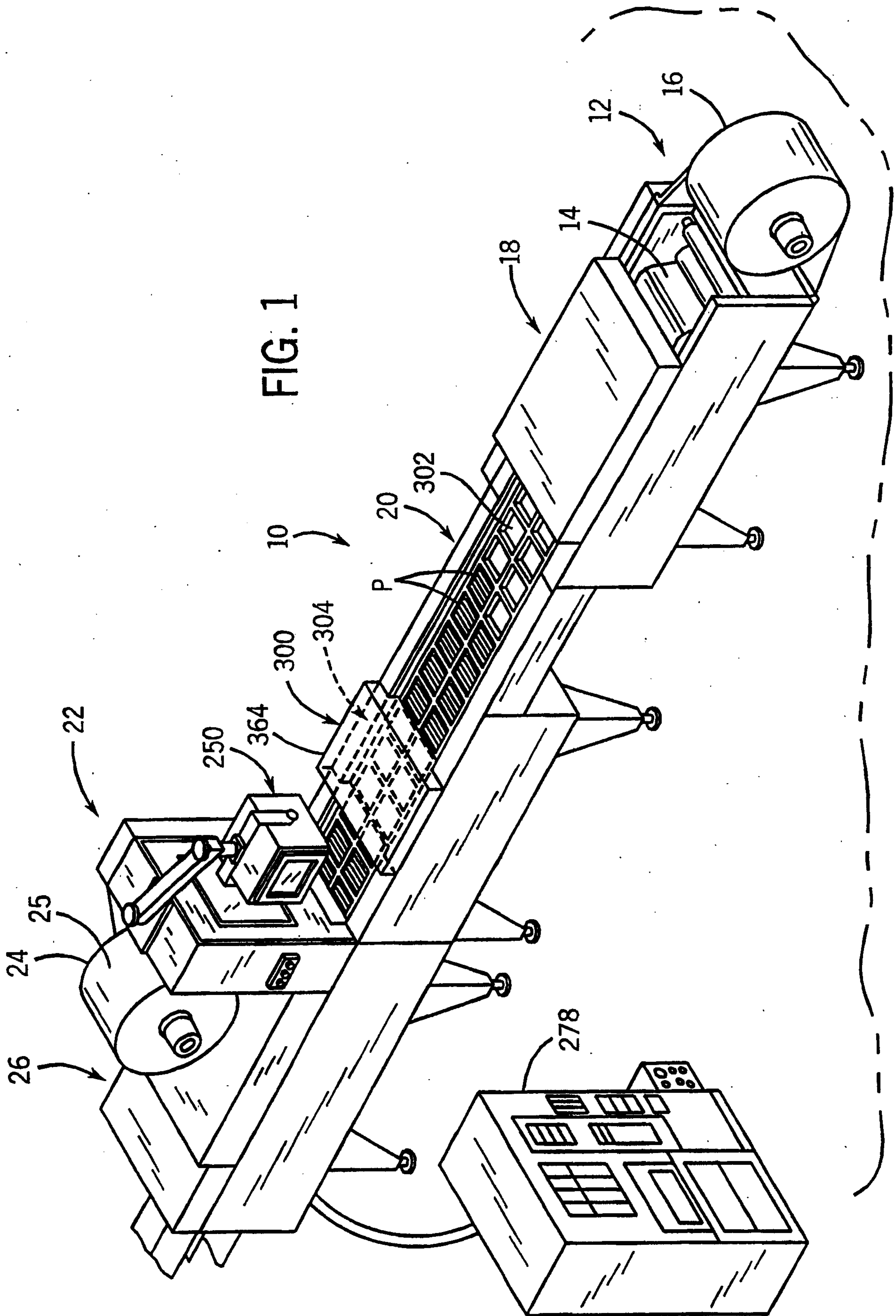
said product cavity pocket in said second condition is draped over and supported by said form-inverter, with said central wall of said product cavity pocket on said central wall of said form-inverter, and said sidewalls of said product cavity pocket extending along the sidewalls of said form-inverter.

16. The packaging apparatus according to claim 14 wherein:

said upper chamber has an upper central wall and a plurality of sidewalls extending downwardly therefrom;

in said first condition of said product cavity pocket, said food product is supported on said central wall of said product cavity pocket and lateral retained by said sidewalls of said product cavity pocket;

in said second condition of said product cavity pocket, said food product is supported on said central wall of said product cavity pocket and laterally retained by said sidewalls of said upper chamber.



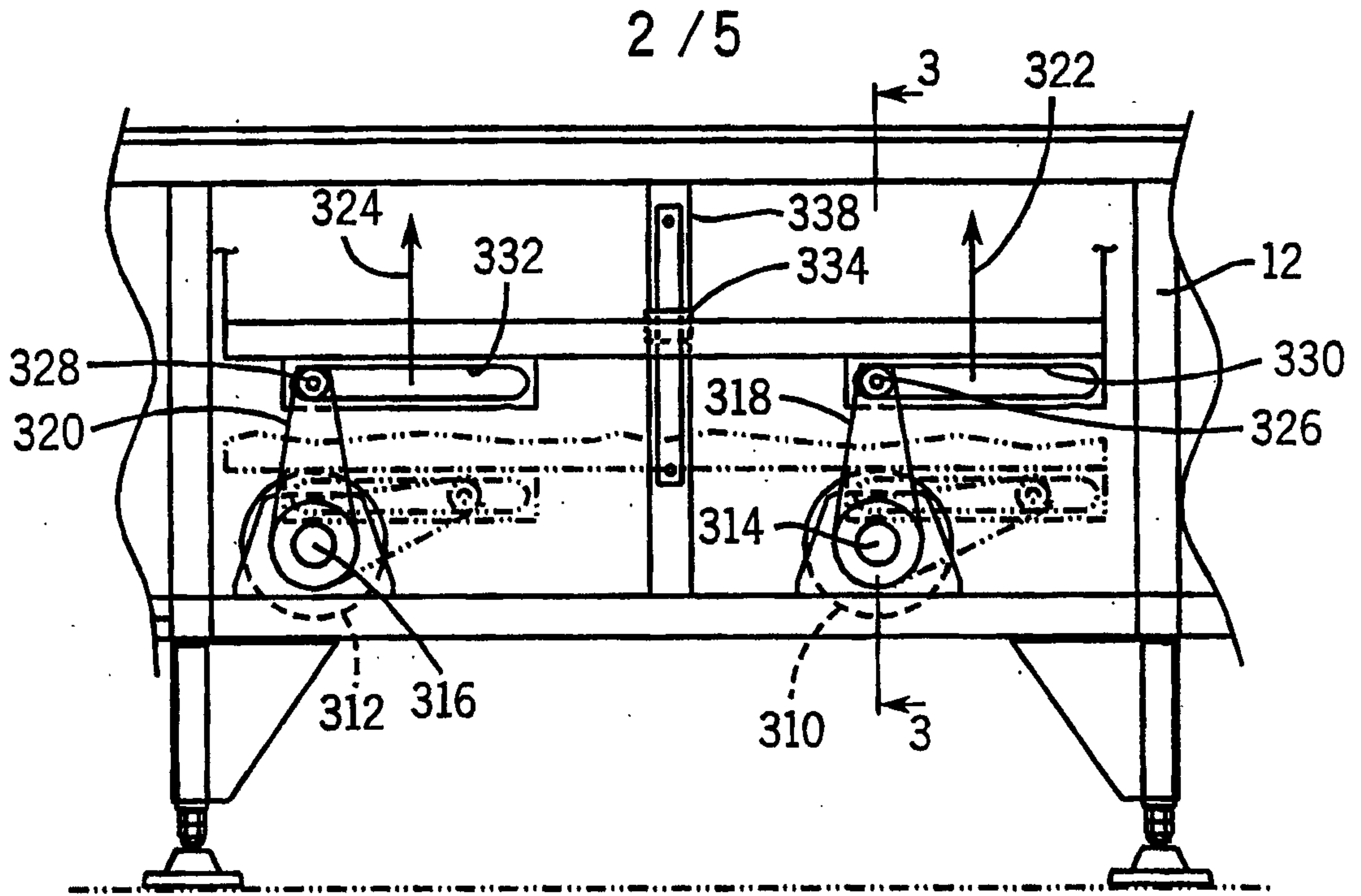


FIG. 2

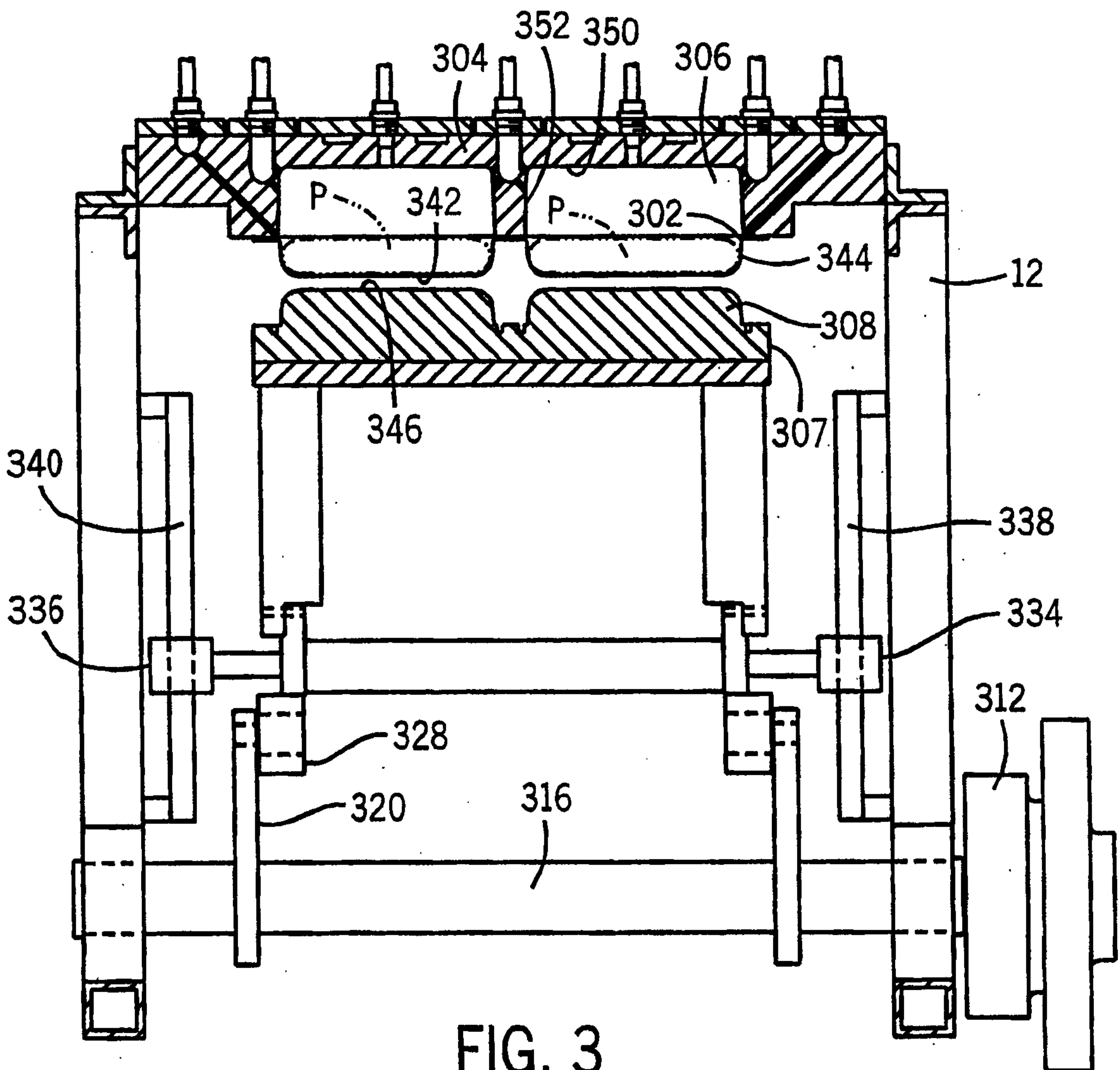


FIG. 3

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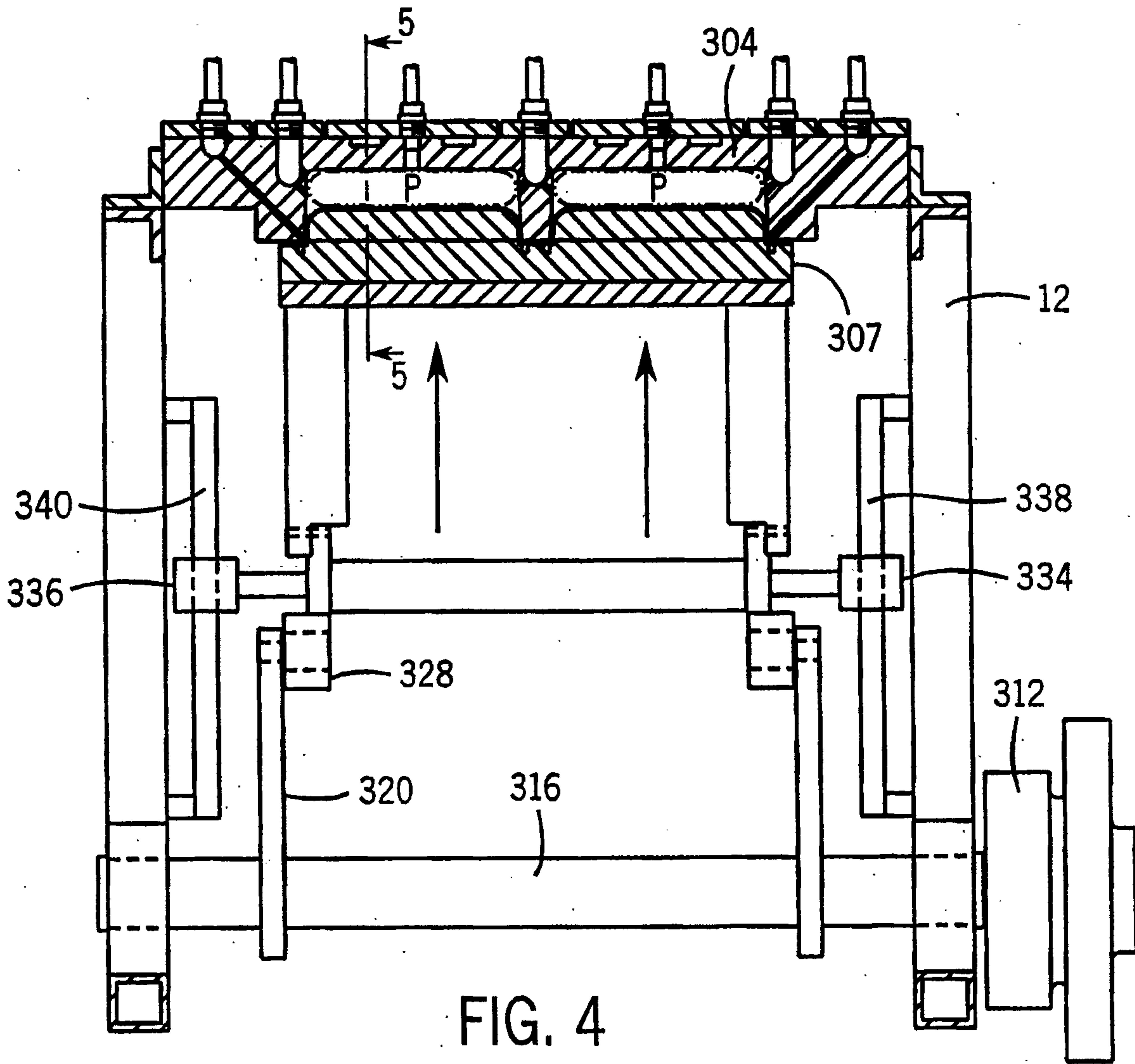
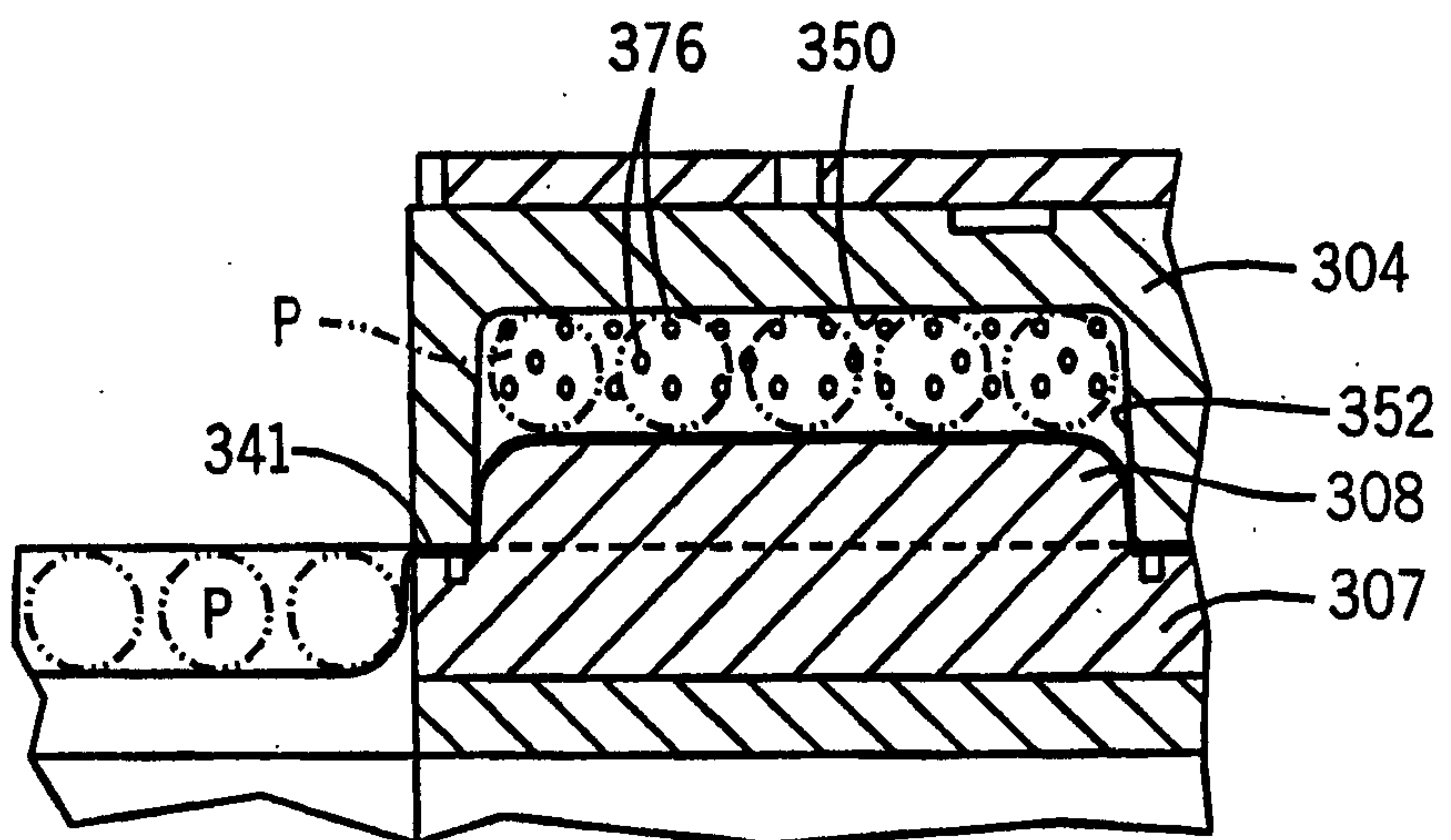


FIG. 4

FIG. 5



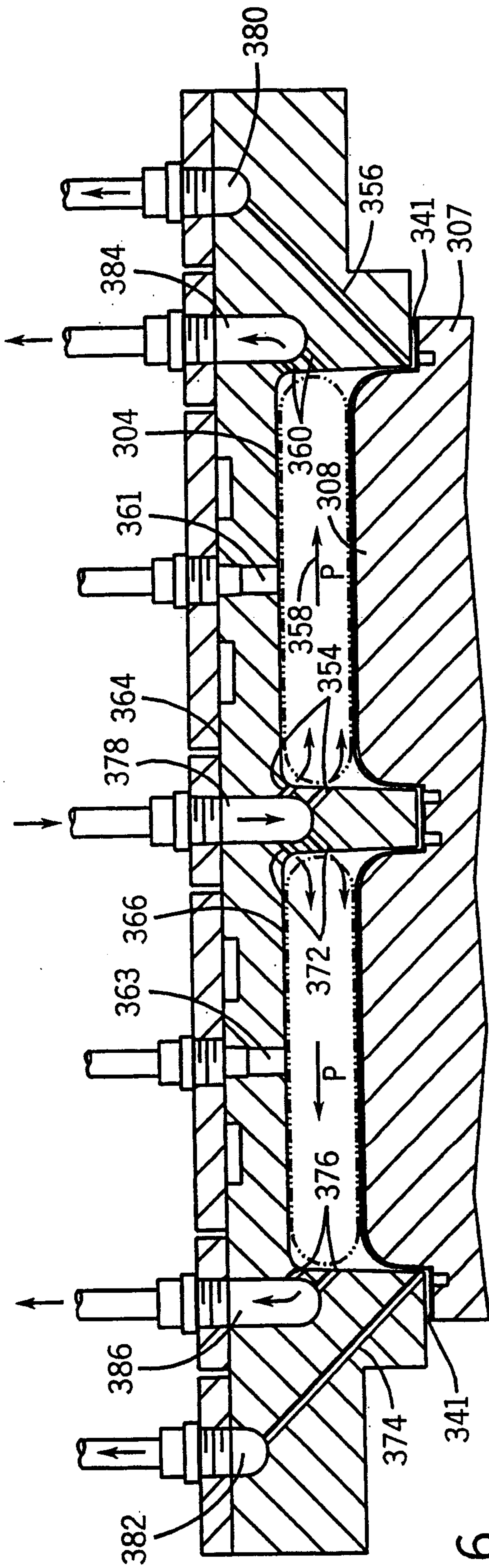


FIG. 6

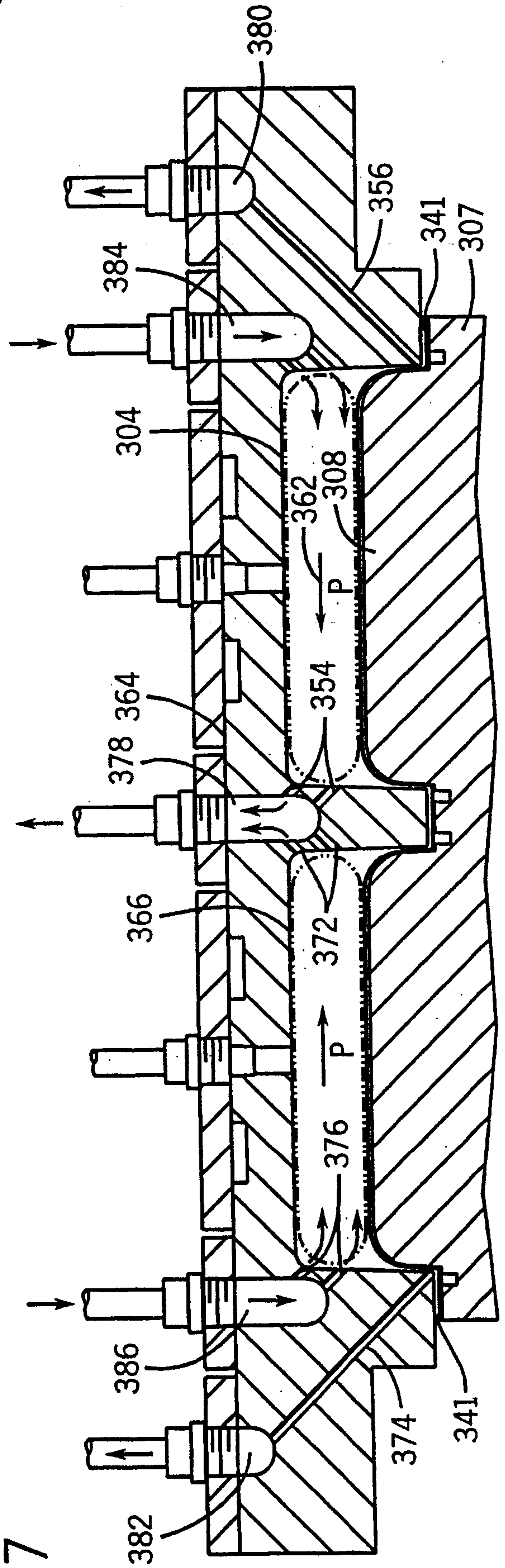


FIG. 7

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