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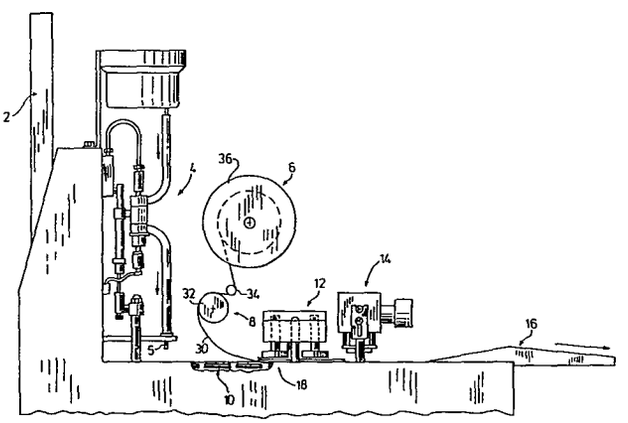
(54) Method and apparatus for accurately positioning a container and a lid of a series of precut lids.

(57) The specification discloses a method and apparatus for accurately positioning a lid of a series of lids above a container flange in preparation for the heat sealing operation. The apparatus is designed to maintain the production rate of prior art filling and packaging machines while still precisely locating a lid such that little or no overhang of the lid relative to the flange of a container occurs. This is achieved by providing a start and stop type conveyor with individual conveyor plates (120) provided with alignment lugs (122, 124) for urging the flange of a container and a lid into alignment.

This system is particularly valuable in the packaging of individual creamer containers.



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Precision Fit Lid Filling Machine

This invention relates to an apparatus and method for precisely locating and aligning a flange of a container and a precut lid of a series of interconnected lids, such that after the heat sealing operation, the body portion of the lid does not overhang the flange of the container.

In recent years, the popularity of individually portioned containers for food products and particularly, dairy products, has rapidly increased and the need to package these products in a suitable manner such that they be served to customer, has been realized by the industry. However, to make these products economically viable, production rates must be fairly high. To achieve these production rates the prior art packaging machines have been designed such that the precise location of the container and a lid is not necessary and tolerance variations in both the lid and container do not appreciably affect the seal. One of the most popular methods of avoiding problems caused by tolerance variations is to provide an oversized lid such that the precise location of the lid relative to the flange is not necessary and the lid only need be generlly located above a flanged container for a proper heat seal to result.

One such method is shown in United States patent 3,838,550 which issued to Mueller, October 1st, 1974 where an oversized heat sealable lid is applied to each container and the resulting overhanging lid is pressed down along the sides of the container. With this method

the precise location of a precut lid relative to a container is not required, however, the resulting product even with the overhanging lid portion pressed down has the appearance of poor workmanship. This problem is further compounded by damage during shipment where the overhanging portion of the lid becomes tattered.

Although these methods ensure a good heat seal between the lid and the container, the resulting product has the appearance of being produced by a cheap process and if the overhanging portion of the lids becomes crimped or torn it leads to the appearance of shoddy workmanship and the suggestion that the product has been tampered with. Therefore, it is desirable to produce a product where the precut lid is of sufficient area to cover the container and align the lid for heat sealing, such that the lid does not overhang the flange after it has been sealed in place. The only exception to this being the tab portion of the lid which projects outwardly from the flange, such that the lid may be removed.

In some applications, a continuous sheet has been applied over nested containers and a dye cutting operation is used to cut out the sealed lid from the sheet material and in some circumstances this cutting operation also dye cuts the container flange. Although this system provides a lid which is precisely located above a container flange the economy and convenience of precut and preprinted lids is not realized.

The present invention overcomes the disadvantages of the prior art machines which have used preprinted and precut

labels while providing the more deriable characteristics of containers sealed with a continuous sheet material and dye cut after the heat sealing operation.

The present invention provides a method for accurately positioning a container and a lid of a series of precut lids for sealing the lid to the container where each lid has a body portion corresponding to the area defined by such container flange and a tab portion for removing a sealed lid, such that the body portion of a heat sealed lid is aligned with and essentially within the periphery of such container flange. The method comprises the steps of:

1. dispensing a container into a conveyor bed adapted to receive such container and accurately locate the flange of such container,
2. advancing the series of interconnected lids synchronously with the movement of the conveyor to provide a free hanging end portion of the series of interconnected lids isolated from velocity and tension fluctuations in the lid supply,
3. positioning the free end portion of such series of like precut interconnected lids above the conveyor and curving down thereto,
4. engaging the periphery of a number of the lids of such looped portion and aligning the periphery with the flange of a nested container,
5. cutting the first lid from such series of interconnected lids and heat sealing such lid to an aligned container flange.

An apparatus is also disclosed for accurately positioning

and aligning a lid of a series of interconnected lids above a container flange in preparation for sealing such a lid to a container. The apparatus includes a conveyor bed for conveying containers and has locating means for spacing containers in the coveyor bed, drive means for indexing the conveyor bed and halt the conveyor at fixed intervals corresponding to the container spacing, and means for synchronously positioning a lid of such series of lids over conveyed containers preparatory to heat sealing a lid to a container flange. The conveyor bed includes alignment means for engaging a container flange and accurately position said flange relative to said conveyor bed, and the alignment means further engages a portion of the periphery of a lid of the series of interconnected lids advancing such series and positioning the body portion of a lid directly above the flange of a nested container and within the periphery thereof.

Preferred embodiments of the invention are shown in the drawings, wherein:

Figure 1 is a side elevation of the container filing and sealing apparatus;

Figure 2 is a partial perspective view of the apparatus showing the conveyor bed and heat sealing station with the clamping pads and heat sealing head partially removed for better observation;

Figure 3 is a side elevation of the conveyor bed and clamping station;

Figure 4 is a top view of the heat sealing station;

Figure 5 is a partial view of two conveyor plates and associated guide rail;

Figure 6 is a perspective of the lid advance mechanism;

Figure 7 is a perspective view of the clamping pads;
Figure 8 is a perspective view of a container with a sealed lid;
Figure 9 is a top view with a lid partially removed from a container, and
Figure 10 shows a portion of a series of interconnected lids and the points of severance for separating the lids.

The apparatus shown in Fig. 1 is designed to fill individual portion creamer containers which have gained wide acceptance throughout both the European and the North American markets. The apparatus has a container supply chute 2, which receives a stack of nested containers and drops the containers at the appropriate time such that a container is received within the coveyor bed 10. The product filling station is generally shown as 4 and is synchronized with the movement of the conveyor bed to fill a container located beneath the spout 5. The lid supply system 6 is adapted to receive a roll of interconnected preprinted and precut container lids with a series of lids being fed past the roller 34 and onto the lid drive drum 32. The drum 32 is constantly driven, in contrast to the intermittent movement of the conveyor bed, such that the series of lids has a curved downward portion 30 which provides some compensation as the series of lids engage alignment means provided with the conveyor bed. The series of lids are generally advanced by the drive drum 32 and the conveyor bed is provided with alignment means for positioning the series of lids directly above containers. Thus the roller 34 and the drive drum 32 form the lid drive mechanism 8.

Both the lid severance station 12 and the heat seal station 14 are driven in timed relationship with the conveyor bed movement and will be more fully described in relation to the remaining figures.

To assist in positively locating the series of interconnecting lids, proximate the upper surface of the conveyor bed, guide member 18 is provided. A container unloading system is generally shown as position 16 in Fig. 1.

The clamping pads support block 62 is shown in Fig. 2 with individual clamping pads 64 journalled within the support block and having a positioning rod 66 adapted to maintain the orientation of the clamping pads. These clamping pads are spring loaded and adapted to move relative to the support block when the drive means 60 lowers the support block relative to the conveyor bed, firmly positioning two adjacent lids and allowing the severance of the interconnecting tab between the lids. The clamping pads are designed to engage only a portion of the lid as the guide rails 17 extend beneath the lid severance station and contact a portion of the lid urging it downwardly into engagement with the lugs 122 and 124 which position and advance the series of interconnected lids with the conveyor movement. Due to the particular arrangement of having the guide rail 17 extend beneath the lid severance station, the clamping pads 64 must maintain their orientation relative to the conveyor bed and thus the rod 66 positively maintains this position and the brackets 68 assure the rod does not accidently disengage the clamping pads. During compression of the

clamping pads, the rod merely moves upwardly with the clamping pads and the brackets 68 are of sufficient height such that the rod does not strike above the brackets.

The heat sealing unit 40 has a number of individual heat sealing pads 42 spring loaded to the base of the heat sealing unit and the drive mechanism 44 secures the heat sealing unit and synchornizes it with the movement conveyor bed. The heat sealing unit is secured to the drive 44 by the yoke and axle arrangement 46 and 48 in combination with the lock pins 50 and apertures 52.

Turning to Figs. 3 and 4, the lid severance and heat sealing station are shown in more full detail. The series of interconnected lids 100 curve downwardly towards the conveyor bed immediately upstream of the clamping station such that only approximately 3 lids of the series engage the conveyor bed prior to severance of a lid from this series. The lid 101 immediately upstream of the severance station, as shown in Fig. 3, is engaging the forward alignment lug 122a of that particular conveyor plate but due to the series of lids curving upward toward drive drum 32, the trailing periphery of the lid has not yet engaged alignment lug 124a. Thus, as shown in Fig. 3, only two lids of the series of interconnected lids fully engage or lie within conveyor plates and the third lid, has not fully engaged a conveyor plate. This aspect of controlling the number of lids engaging the conveyor is important because tolerance variations in the exact spacing between lids of the series

of interconnecting lids will vary within manufacturing tolerances and the cumulative variation of these tolerances increases with the number of conveyor plates engaged.

The conveyor apparatus as shown in Fig. 3 is positioned such that the conveyor bed is now stationary and the clamping pads 64 and heat sealing head 40 will move downwardly to free a lid from the series of interconnected lids and heat seal a lid to a container. After sufficient movement of the clamping pads 64, the knife 63 contacts the interconnecting tab portion of a lid and severs it freeing a lid from a series of interconnected lids. The guide rails 17 assure the series of interconnected lids remain in engagement with a portion of the conveyor bed and also assure the freed lid remains in proper location with the alignment lugs in preparation for the heat sealing operation. These guide rails 17 are supported by bar member 19 which traverses across the width of the conveyor and, is secured to the supporting sidewalls of the machine.

Several plates of the conveyor bed are shown in Fig. 5 in relation to the guide rails 17. The conveyor plate 120b has been cut away through a nested container, showing the relationship between the alignment lugs 122 and 124, flange 200 of a nested container and aperture 121 provided in the conveyor plate. Each of the alignment lugs has been provided with a curved portion 125 corresponding to a portion of the outer periphery of the flange 200. At the upper surface of the conveyor plate, the curved portion 125 is adapted to essentially contact the

outer periphery of the flange 200 with both sets of alignment lugs 122 and 124. The curved portion 125 tapers upward and outwardly from the upper surface of the conveyor plate to provide a guide means for initially, loosely receiving the container flange 200 and subsequently aligning this flange in relationship to the conveyor plate which has been recessed to receive the flange. As can be seen, the aperture 121 provided in the plate is oversized relative to the body of the nested container such that the exact position of the container in the conveyor bed is determined by the inter-engagement of the container flange and the alignment lugs.

During the thermoforming process of these containers, wide tolerance variations are expected between the center axis of the container and the center azix of the container flange. Although these axis should be the same, variations do occur; however, the outer periphery of the flange is relatively constant and only varies within much smaller tolerances as it is dye cut. For example, tolerance variations in the size of lids and the diameter of creamer containers may be up to approximately four thousandths and three thousandths of an inch respectively whereas variations in the position of the center of the container may be as much as 20 thousandths of an inch. Thus, by aligning the container by contacting th flange and having these same alignment lugs position the series of interconnected lids, accurate positioning of the lid, relative to the container flange can be achieved and the wide tolerance variation of the position of the center axis of the container, do not affect the sealing operation of the apparatus. Therefore, the need for

oversized lids or more strict control over existing manufacturing tolerances of both lids and containers is not required with the present apparatus while still allowing precise location of the lid relative to the container flange such that the body portion 102 of the lids is directly above the container flange and only the tab portion 104 projects beyond the container flange.

The guide rail 17 shown in Fig. 5 extends between alignment lugs of adjacent container apertures 121c and is of sufficient width to contact a portion of both adjacent lids. Although this rail is in close proximity to the conveyor bed, it is not in contact with the bed and actually allows the series of interconnected lids to move along a portion of the tapered surface 125, but not above the alignment lugs thus, providing some compensation for tolerances. During the clamping operation and the heat sealing operation, a lid in contact with the alignment lug is forced downwardly and the tapered section contacts the periphery of the lid and positions it relative to the container flange. Therefore, the precise location of th lid is assisted due to the clamping action of the clamping pad 64 and during the downward movement of the heat sealing head 40, prior to bottoming out against the conveyor bed.

The present system achieves the result of precisely locating the lid above a container flange by allowing for a small degree of tolerance variations due to the tapered alignment lugs 124 and 122 as well as the curved portion 100 of the series of interconnected lids which is achieved through the operation of the drive drum 32. This

drive drum is shown in more detail in Fig. 6 and is provided with projecting lugs 37 for engaging the series of interconnected lids. Because the drive drum 32 is constantly driven and the conveyor is intermittently advanced, the curved portion 100 is always varying to a certain extent. However, the arrangement is such that the series of lids may be positioned on drum 32 such that free end portion of the lids always curve downward to the conveyor bed in a manner such that they readily engage and move with advancement of the conveyor bed. Thus drum 32 isolates the free end portion of the series of lids from velocity and tensions, fluctuations between drum 32 and the supply roll 36. It is preferred to have the drum 32 constantly driven to avoid problems such as tearing of the lids between the drum and the supply roll 36 which may occur should the drum be indexed with movement of the conveyor bed.

As can be seen in Fig. 7 the clamping pads 64 are not circular so they do not contact the guide rails 17 during the clamping operation.

Figs. 8 and 9 show containers heat sealed by this process and the body portion 102 of the lid is located within the periphery of the flange. The tab portion 104 of the lid projects from the lid and assists in removal of the lid by the end user. By cutting the lids along the severance lines 105, shown in Fig. 10, the overall appearance of the finished product is enhanced as only one tab portion is provided and is preferred according to the invention.

The present invention utilizes precut, preprinted inter-

connected lids in combination with containers mass produced by thermoforming techniques while still providing a system in which the lid essentially corresponds to the periphery of the flange of the containers and is heat sealed thereto. Such a system results in cost savings due to the reduced size of container lids and provides a product that is less vulnerable to lid damage. Thus the final product does not appear tattered when served for consumption and the consumer is not as likely to immediately question the quality of the product.

Prior art systems have provided wide tolerance allowances in both the apparatus for handling this type of packaging operation as well as in the individual components but result in a somewhat shabby looking finished product. The present system is capable of high production output as well as obtaining the desirable characteristics of a more finished final product.

Claims

1. A method for accurately positioning a container and a lid of a series of precut lids for sealing such lid to such container where each lid has a body portion corresponding to the area defined by such container flange and a tab portion for removing a sealed lid such that the body portion of a heat sealed lid is aligned with and essentially within the periphery of such container flange comprising the steps of:

1. dispensing a container into a conveyor bed adapted to receive such container and accurately locate the flange of such container.
2. advancing the series of interconnected lids synchronously with the movement of the conveyor to provide a free hanging end portion of the series of interconnected lids isolated from velocity and tension fluctuations in the lid supply,
3. positioning the free end portion of such series of like precut interconnected lids above the conveyor and curving down thereto,
4. engaging the periphery of a number of the lids of such looped portion and aligning the periphery with the flange of a nested container,
5. cutting the first lid from such series of interconnected lids and heat sealing such lid to an aligned container flange.

2. An apparatus for accurately positioning and aligning a lid of a series of interconnected lids above a container flange in preparation for sealing such lid to a container, each lid having a body portion corresponding to the area defined by such container flange and a tab portion for

removing a heat sealed lid from a container comprising a conveyor bed for conveying containers and having locating means for spacing said containers in said conveyor bed, drive means for indexing the conveyor bed and halt said conveyor at fixed intervals corresponding to such container spacing; means for synchronously positioning a lid of such series of lids over conveyed containers preparatory to heat sealing a lid to a container flange wherein said conveyor bed includes alignment means for engaging a container flange and accurately position said flange relative to said conveyor bed, said alignment means further engaging a portion of the periphery of a lid of such series of interconnected lids advancing such series and positioning the body portion of a lid directly above the flange of a nested container and within the periphery thereof.

3. An apparatus as claimed in claim 2, wherein said conveyor bed is provided with apertures for loosely receiving the body of a container such that a container is supported in said conveyor bed by the flanged portion and wherein said alignment means includes four projecting lugs spaced on either side of the center line of the container aligned with the direction of movement of the conveyor, said lugs being positioned to minimize movement of a lid relative to a container aperture of the conveyor bed, said lugs defining an upwardly opening guide means for accurately positioning a lid above a container.

4. An apparataus as claimed in claim 3, wherein said lugs are paired fore and aft of the aperture and spaced to receive and engage the tab portion of a lid.

5. An apparatus as claimed in claim 4, wherein said lugs having an interior surface for snuggly engaging a portion of a container flange.

6. An apparatus as claimed in claim 5, wherein said conveyor bed is recessed about each aperture for receiving a container flange.

7. An apparatus for positioning and aligning a lid of a series of interconnected precut lids above a flanged container in preparation for heat sealing of such container, each lid of such series of interconnected lids having a body portion to cover the container and of essentially equal area and a tab portion joining adjacent body portions and when cut allowing separation of a heat sealed lid from a container comprising a plurality of conveyor plates linked together to form an endless conveyor; drive means for indexing said conveyor and halt said conveyor at fixed intervals; means for synchronously positioning a lid of such series of lids over a conveyed container; each conveyor plate having an aperture sized to loosely receive the body of a container and alignment portions projecting above said plate for accurately locating the flange of a container and for engaging a portion of the periphery of the body portion of a lid and center it above the flange of a container, said synchronous positioning means providing a downwardly sloping end portion of the series of interconnectged lids isolated from fluctuations in the lid supply system positioned such that approximately three lids engage respective alignment portions, said alignment portions advancing the lids during conveyor movement and aligning

such lids directly above the flange of nested containers; said apparatus further including a lid severance station for clamping adjacent lids and cutting the interconnecting tab portion and a heat seal station for sealing of a lid to a container flange.

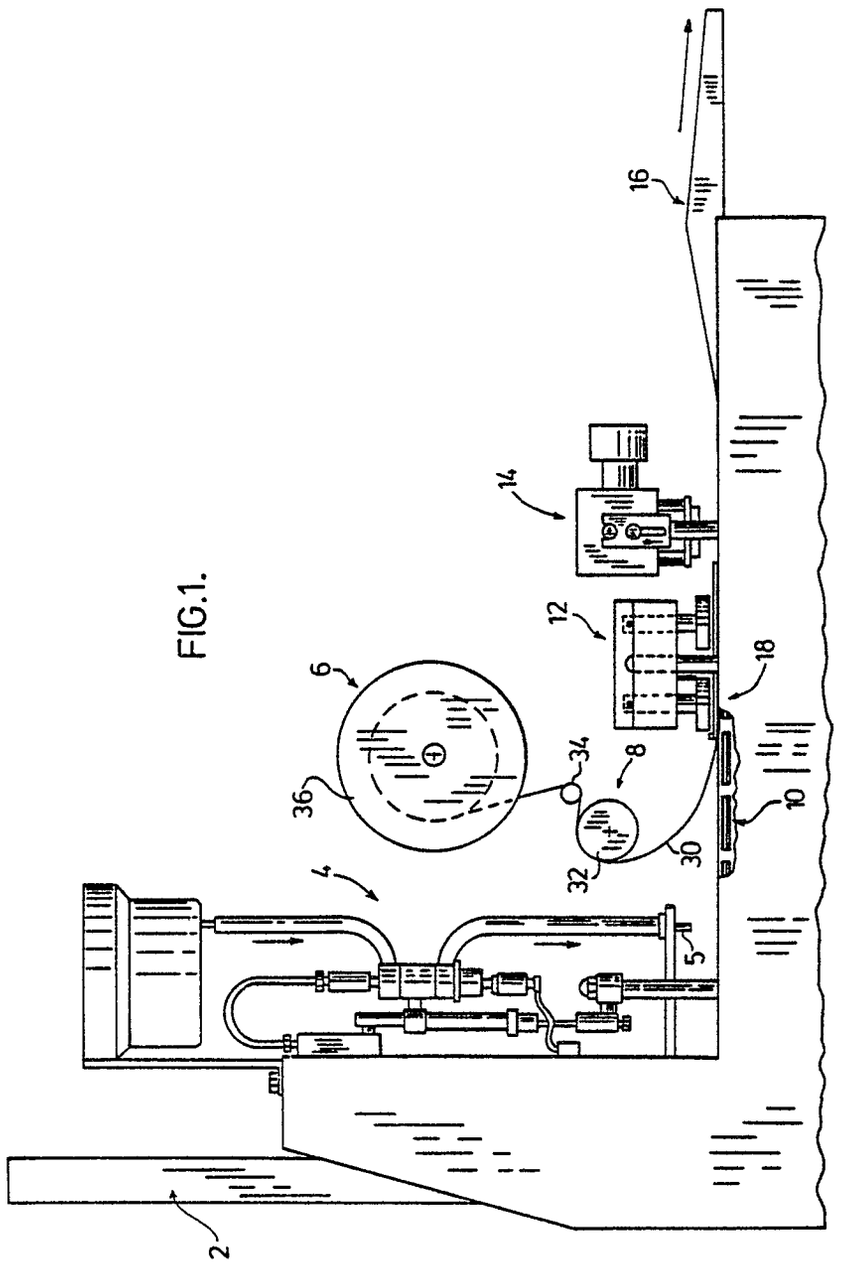
8. The apparatus as claimed in claim 7 further including guide rails positioned above the conveyor and adjacent said lid severance station to force said series of lids downwardly into said alignment portions and immediately above the flange of a nested container.

9. An apparatus as claimed in claim 7 or 8, wherein said conveyor plate is recessed about each aperture for receiving a container flange.

10. An apparatus as claimed in claim 7 or 8, wherein said apparatus is adapted to provide a plurality of lanes for sealing a number of containers simultaneoulsy.

11. An apparatus as claimed in claim 2, 3 or 4, further including guide members proximate the upper surface of the conveyor for forcing such series of interconnected lids downwardly into said alignment means.

FIG.1.



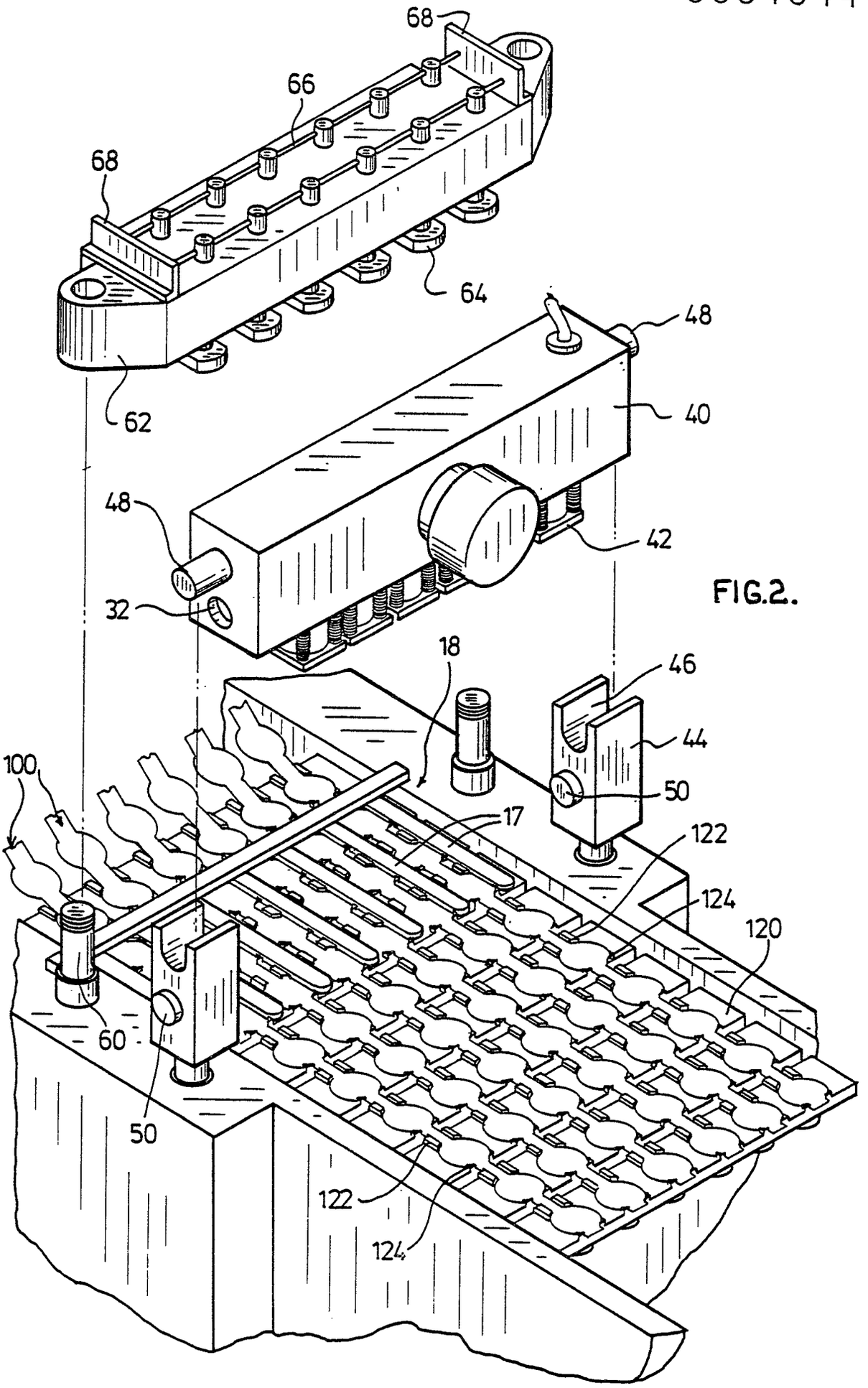

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FIG.2.

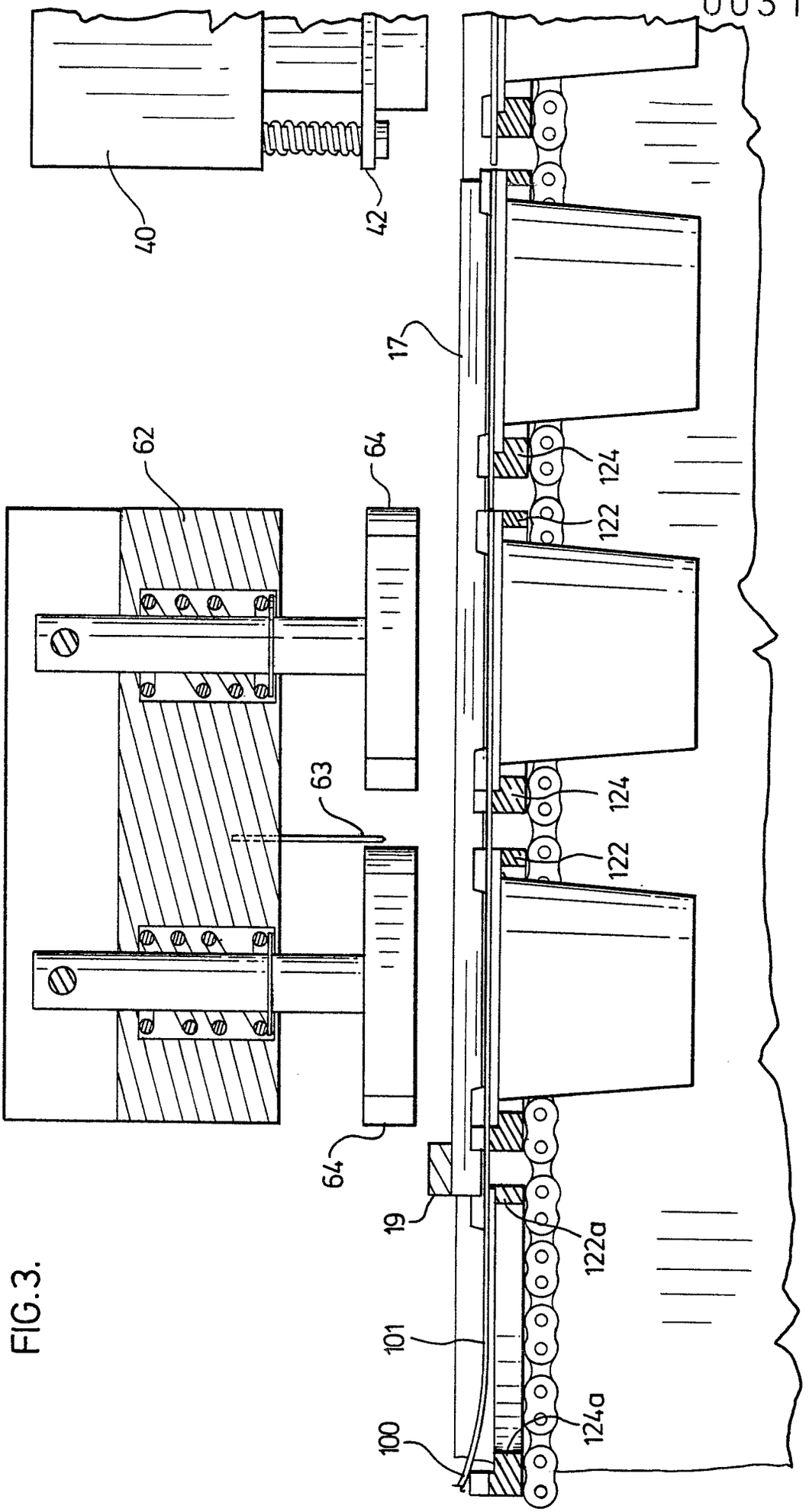


FIG.3.

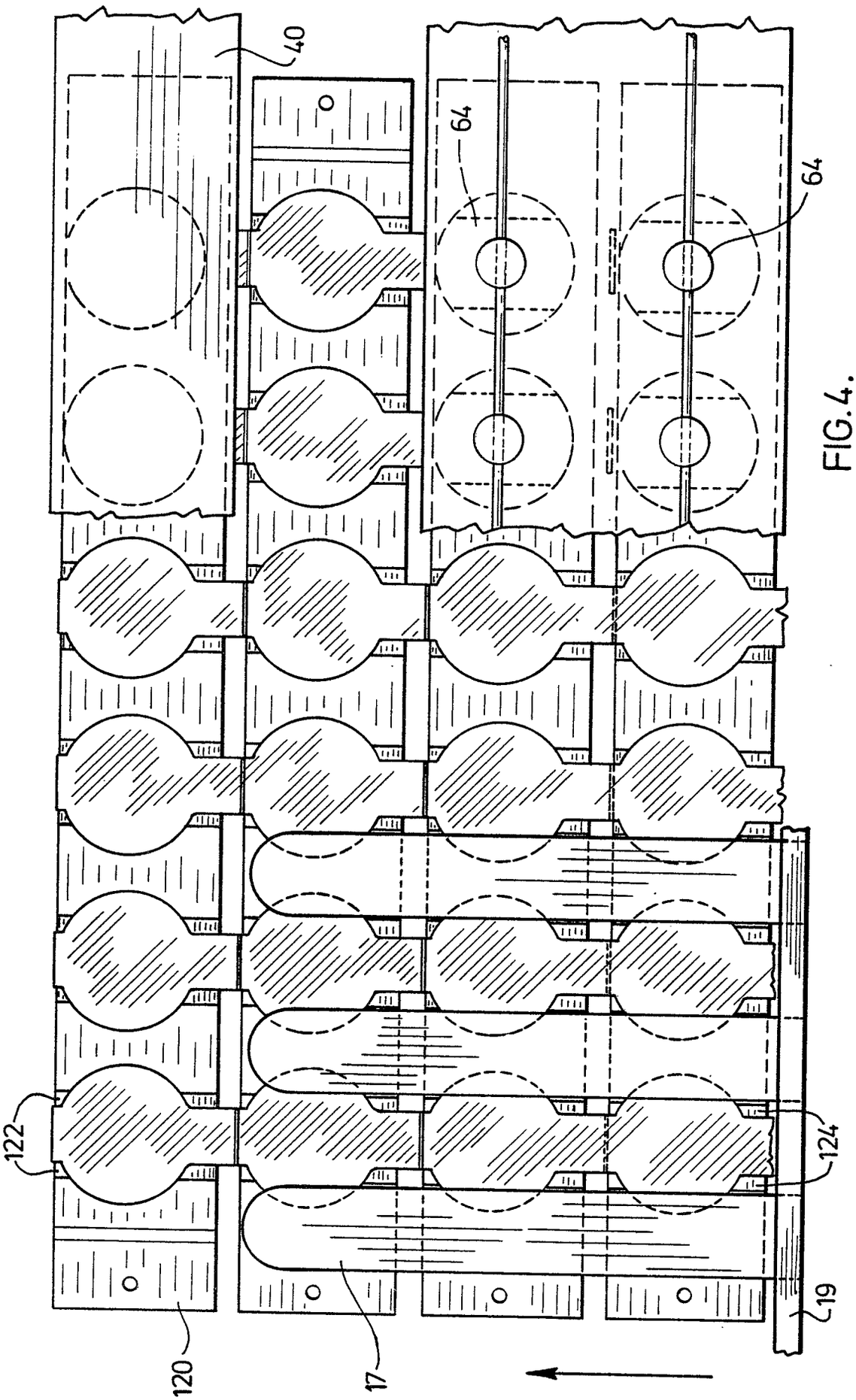


FIG.4.

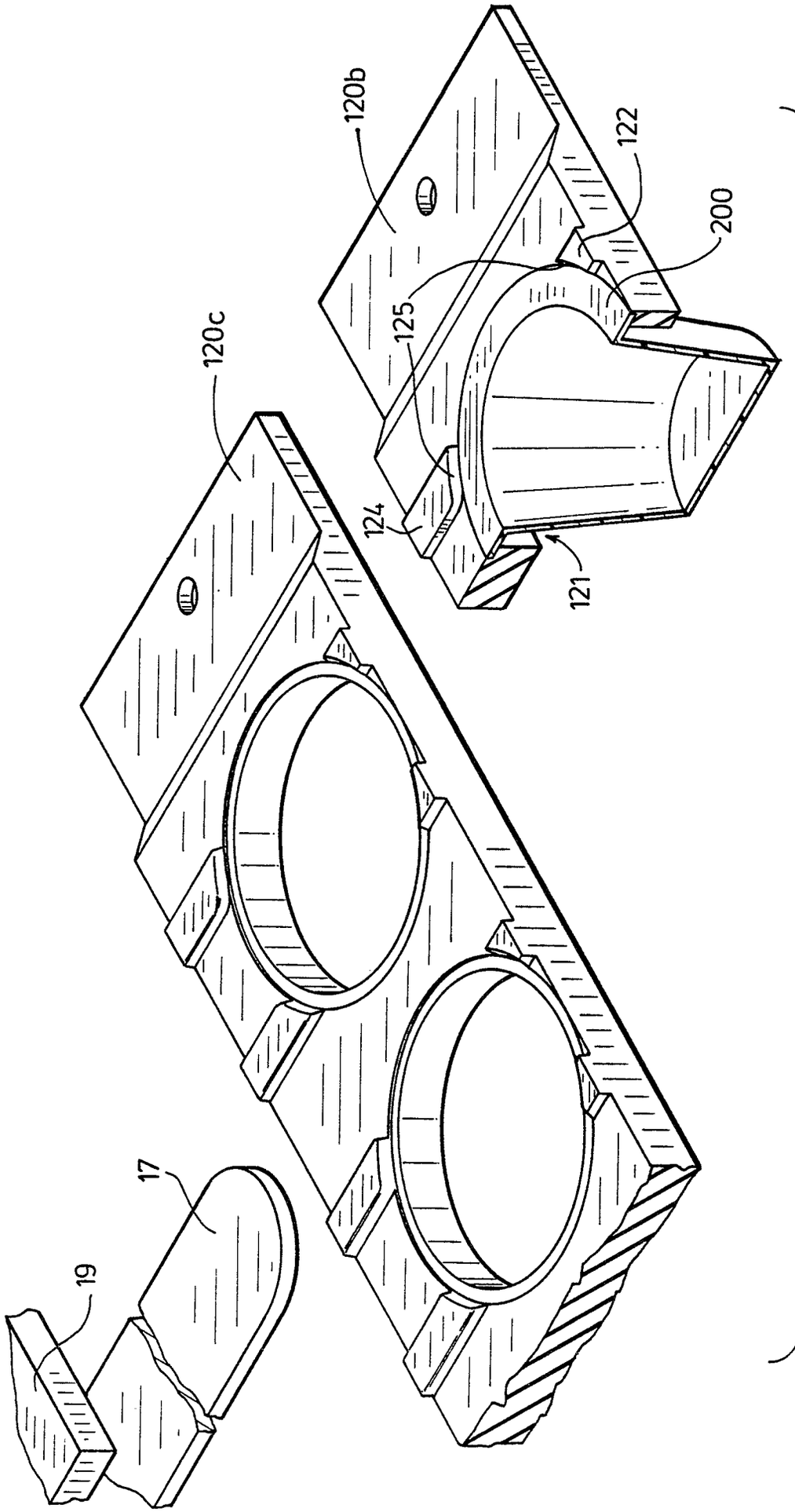


FIG.5.

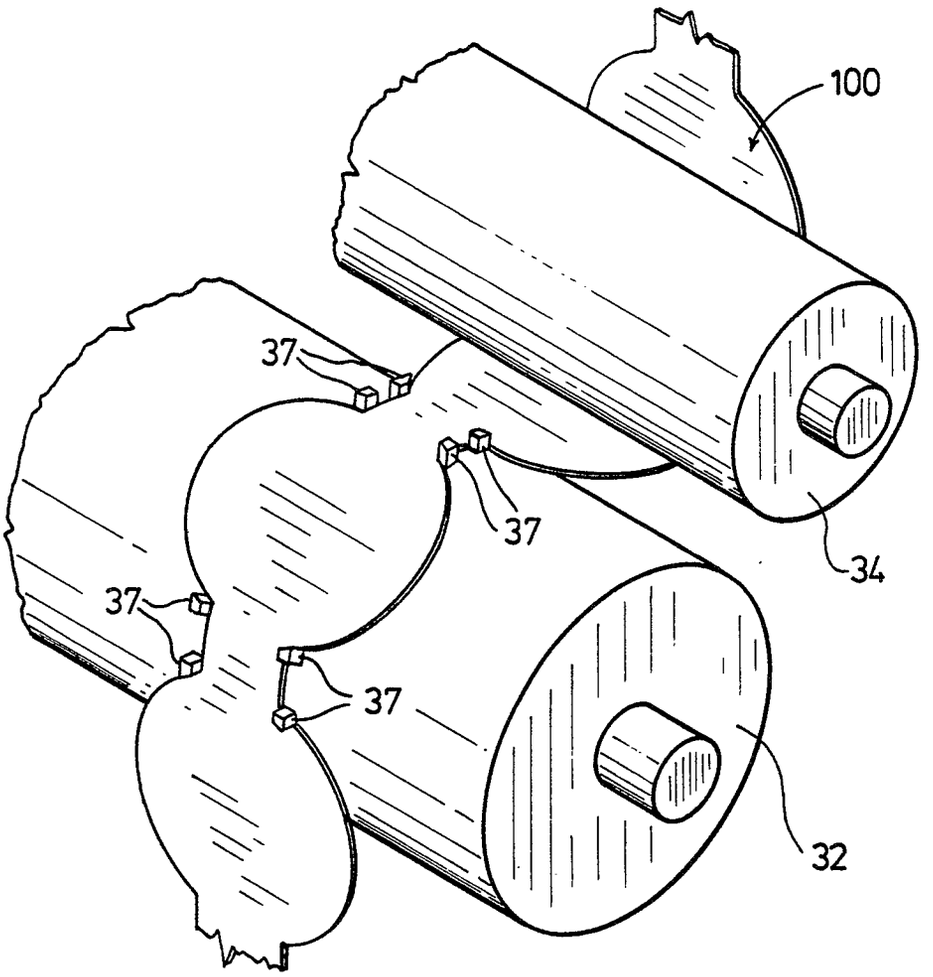


FIG.6.

FIG.7.

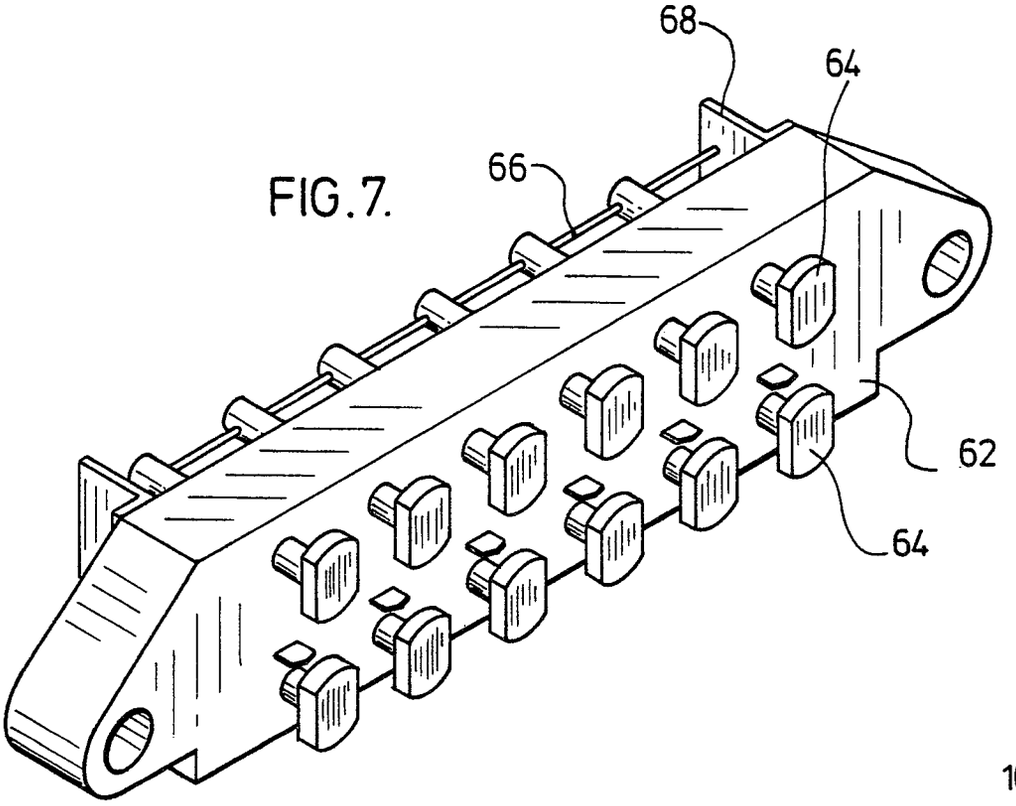
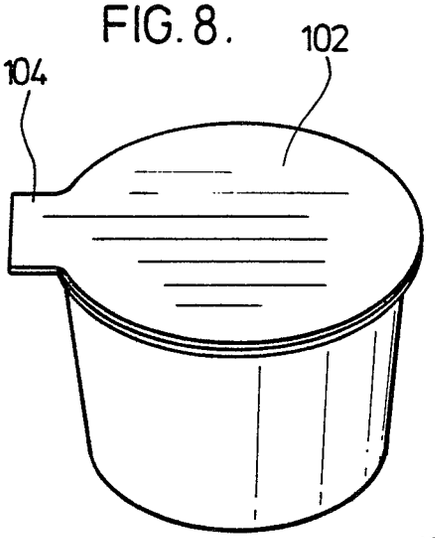


FIG.8.



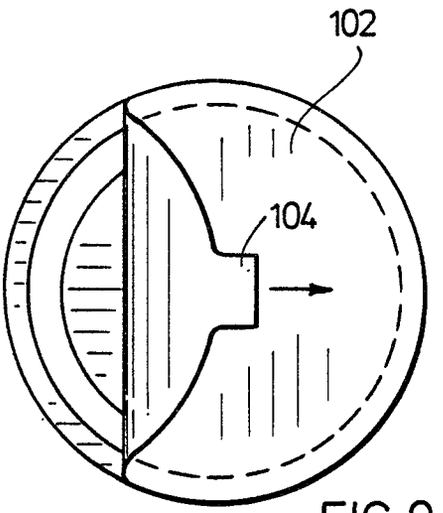
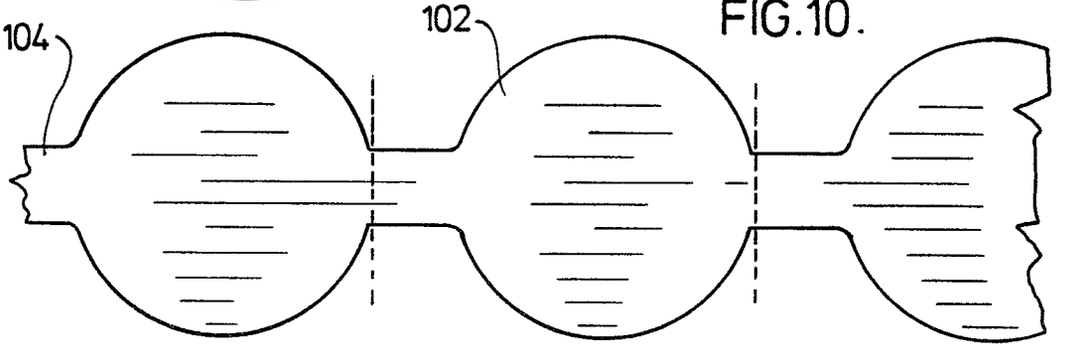


FIG.9.

FIG.10.



European Patent Office

EUROPEAN SEARCH REPORT

0031644

Application number

EP 80 30 4128

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US - A - 4 176 507 (CONSUMERS GLASS COMPANY) * the whole document * ---	1-3, 7,8, 10,11
	DE - A - 1 955 974 (GANZHORN & STIRN) * page 6, lines 1-7; figure 1 * ---------	3-5

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

B 65 B 7/28

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 65 B

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

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

Place of search	Date of completion of the search	Examiner
The Hague	18.03.1981	KIRSCHBAUM

EPO Form 1503.1 06.78