

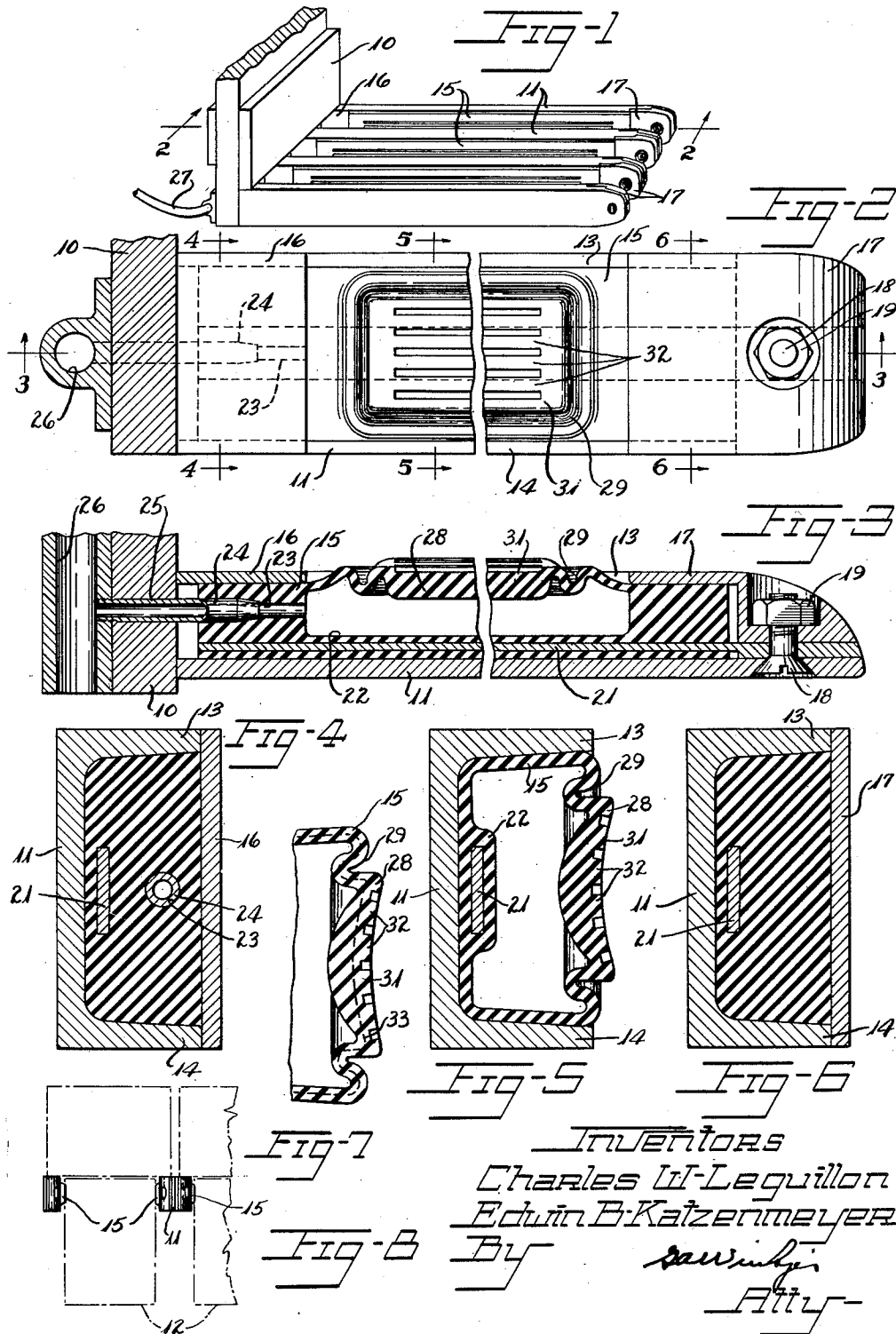
March 11, 1952

C. W. LEGUILLON ET AL

2,589,101

LIFT TRUCK FORK TUBE

Filed March 23, 1948



Inventors
 Charles W. Leguillon
 Edwin B. Katzenmeyer
 By *Lawrence J. ...*
 Att'y-

UNITED STATES PATENT OFFICE

2,589,101

LIFT TRUCK FORK TUBE

Charles W. Leguillon, Akron, and Edwin B. Katzenmeyer, Cuyahoga Falls, Ohio, assignors to The B. F. Goodrich Company, New York, N. Y., a corporation of New York

Application March 23, 1948, Serial No. 16,566

11 Claims. (Cl. 214-113)

1

This invention relates to lift-truck forks and more particularly to a distender for releasably exerting gripping pressure on articles to be conveyed between the tines of the forks.

Objects of the invention are to provide an improved article-conveyor distender, to provide for a substantial effective pressure face of the distender, to provide a surface with a contour conformable or compliant to the surface contour of the retaining body, to provide for extensive range of movement of the pressure face, to provide a distender in the form of a tube adapted to be mounted on the side of a fork tine, to provide for facilitating return movement of the pressure face upon deflation of the distender, to provide for distension of the distender with a minimum of stretching of the wall, and to provide for simplicity of assembly and effectiveness in operation. These and other objects will be apparent from the following description, reference being had to the accompanying drawing in which:

Fig. 1 is a perspective view of a forked supporting structure having retaining distenders constructed in accordance with and embodying the invention, parts being broken away.

Fig. 2 is a section taken along line 2-2 of Fig. 1.

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

Fig. 4 is a section taken along line 4-4 of Fig. 2.

Fig. 5 is a section taken along line 5-5 of Fig. 2.

Fig. 6 is a section taken along line 6-6 of Fig. 2.

Fig. 7 is a section like Fig. 5 of a modified distender construction, parts being broken away.

Fig. 8 is a front elevation of a forked supporting structure with the distender in the inflated condition showing supported articles in dot and dash lines, parts being broken away.

The invention makes possible a distensible tube having a substantially flat pressure face when inflated for effectively gripping a body such as a box, brick or the like or a group of the same by exerting substantially the same unit pressure over the entire pressure face of the tube. This is desirable in that it provides improved gripping and lessens the distending pressure required. While a flat pressure face in the distended condition is desirable for gripping flat faced articles the pressure face may be shaped as desired to suit the articles being gripped. Uniform distribution of pressure over the pressure face is especially advantageous in handling fragile articles such as

2

cardboard boxes which cannot withstand concentrated unit pressures. With the large effective area of contact between the pressure face and the articles heavy loads may be handled without imposing high unit pressures on the articles.

Provision is made for a large range of movement of the pressure face while nevertheless providing a pressure face area that remains substantially constant throughout the range of movement and resists outward bowing which would reduce the desired unit pressure distribution.

The article-conveyor distender of this invention is useful especially in connection with a forked commodity handling and supporting structure 10 as shown in Fig. 1. In this structure 10 parallel tines 11, 11 of the fork are disposed at spaced-apart positions for embracing articles 12, 12 therebetween. The opposing faces of the tines 11, 11 have upper and lower flanges 13 and 14 for supporting distenders 15, 15. Cover plates 16 and 17 for retaining the distenders 15, 15 are mounted on the flanges 13 and 14 at the ends of the tines 11, 11. The cover plates 17, 17 at the free ends of the tines 11, 11 are mounted on the tines by bolts 18, 18 and nuts 19, 19.

Each distender 15, in accordance with the invention, may be of resilient rubber or other rubber-like material and is tubular and may be rectangular in cross-section as shown in Fig. 5 and have a reinforcing strip 21 embedded in a rib 22 of the distender base wall. The reinforcing strip 21 may be molded in the distender 15 or inserted in a cavity therein and projects from the end of the distender. The strip 21 has an aperture in the projection for receiving the bolt 18 which fastens the cover plate 17 to the tine 11.

Each distender 15 has an opening 23 at one end which is adapted to receive a nipple 24 of a conduit 25 which is connected to a manifold 26 which supplies fluid to all the distenders 15, 15 from a fluid pressure source which may be connected to the manifold by a flexible conduit 27.

A wall 28 opposite the base wall of each distender 15 is constructed to move outwardly upon an increase of fluid pressure within the distender and to return to its original position upon a decrease in the fluid pressure. The outer margin of the wall 28 of the distender 15 is disposed in a devious configuration in section such as in corrugations 29, 29 which may be disposed substantially parallel to the edges of the wall. The pressure face 31 of the distensible wall 28 which is engageable with the article to be retained may be relatively thicker than the margin and may

3

be bowed with the thickened central portion decreasing in thickness toward the margin providing an outer concave and an inner convex surface as shown in Fig. 5. In addition the engaging surfaces of the pressure face 31 may have parallel lands 32, 32 with intervening grooves extending longitudinally of the tube to assist the gripping action of the pressure face.

In operation, when the fluid pressure, which may be pneumatic or hydraulic, is increased in the distender 15 the resulting forces tend to urge the distensible wall 28 outwardly from the tine 11. The resistance to movement of the wall 28 is relatively small because the major resistance to be overcome is the bending of the corrugations which are straightened during distension of the wall 28. The resistance to bending of the margin of the wall 28 is not large because the wall is relatively thin and is of a resilient flexible rubber-like material. This construction enables the pressure face 31 to maintain a substantially flat surface without undesirable outward bowing and in so doing provides a highly uniform distribution of pressure over the contact area. The tendency for outward bowing which is present in all inflatable articles but which is slight in the construction herein described, may be compensated for by the concavo-convex cross-section of the pressure face 31.

Referring to Fig. 7 a modified form of the distender 15 is shown in which a reinforcing element such as fabric 33 is added to provide greater strength to the distender when this is desired. As shown, this fabric 33 may be embedded in the wall 28 of the distender and united with the rubber by vulcanization, and may extend through the distensible wall 28 and into the sidewall and if desired entirely around the distender.

Variations may be made without departing from the scope of the invention as it is defined in the following claims.

We claim:

1. An article-conveyor distender for gripping the article in the conveying thereof, said distender comprising a chamber having a flexible article-gripping wall comprising an extensive flexible pressure face for exerting pressure compliantly against the article, said wall having a movable marginal portion of flexible material of devious shape in cross-section extending in the direction from the edge of said face towards the outer margins of said wall in the undistended condition of said distender and of a relatively straightened shape in cross-section in the distended condition of said distender to accommodate extensive movement of said face and flexure thereof without substantial outward bowing of said face under fluid pressure distension of said wall.

2. An article-conveyor distender for gripping the article in the conveying thereof, said distender comprising a chamber having a flexible article-gripping wall of resilient rubber-like material comprising an extensive flexible pressure face portion for exerting pressure compliantly against the article and said wall having a movable marginal portion of devious shape in cross-section extending in the direction from the edge of said face towards the outer margins of said wall in the undistended condition of said distender and of a relatively straightened shape in cross-section in the distended condition of said distender and of relatively less thickness than said pressure face portion to accommodate extensive outward movement of said face and flexure there-

4

of without substantial outward bowing of said face under fluid-pressure distension of said wall.

3. An article-conveyor distender for gripping the article in the conveying thereof, said distender comprising a chamber having a flexible article-gripping wall of resilient rubber-like material comprising an extensive flexible pressure face portion for exerting pressure compliantly against the article, said pressure face portion being bowed inwardly of said chamber in the undistended condition and having greater thickness centrally of its margin than at its margin, providing for outward movement of said pressure face and flexure thereof without substantial outward bowing of said face under fluid pressure distension of said wall.

4. An article-conveyor distender for gripping the article in the conveying thereof, said distender comprising a tube of resilient rubber-like material, said tube having a base including a reinforcing member therein and a flexible article-gripping wall opposite said base comprising an extensive flexible pressure face for exerting pressure compliantly against the article and said wall having a movable marginal portion of devious shape in cross-section extending in the direction from the edge of said face towards the outer margins of said wall in the undistended condition of said tube and of a relatively straightened shape in cross-section in the distended condition of said tube to accommodate extensive outward movement of said face and flexure thereof without substantial outward bowing of said face under fluid pressure distension of said tube.

5. A lift-truck fork distender for gripping an article interposed between the tines of the fork comprising a tube disposed along the side of a tine, said tube having a flexible article-gripping wall including an extensive flexible pressure face for exerting pressure compliantly against the article and said wall having a movable marginal portion of devious shape in cross-section extending in the direction from the edge of said face towards the outer margins of said wall in the undistended condition of said tube and of a relatively straightened shape in cross-section in the distended condition of said tube to accommodate extensive movement of said pressure face toward the opposing tine and flexure of said pressure face without substantial bowing of said face under fluid-pressure distension of said tube.

6. A lift-truck fork distender for gripping an article interposed between the tines of the fork comprising a tube disposed along the side of a tine, said tube having a flexible article-gripping wall including an extensive flexible pressure face for exerting pressure compliantly against the article and said wall having in section a thickened portion centrally in said face thereof decreasing in thickness toward the margin thereof and continuing in a movable marginal portion of devious shape in cross-section extending in the direction from the edge of said face towards the outer margins of said wall in the undistended condition of said distender and of a relatively straightened shape in cross-section in the distended condition of said distender to accommodate extensive movement of said pressure face toward the opposing tine and flexure of said pressure face without substantial bowing of said face under fluid-pressure distension of said tube.

7. A lift-truck fork distender for gripping an article interposed between the tines of the fork comprising an elongated tube disposed along the side of a tine, said tube having a wall including

5

an extensive pressure face for exerting pressure against the article and said pressure face having grooves and lands disposed longitudinally of said tube, said wall having a marginal portion of flexible material of devious shape in cross-section to accommodate extensive movement of said pressure face toward opposing tines without substantial outward bowing of said face under fluid-pressure distension of said tube.

8. A lift-truck fork distender for gripping an article interposed between the tines of the fork comprising an elongated tube of resilient rubber-like material, said tube being mounted on a tine and having a wall including an extensive pressure face for exerting pressure against the article to urge the article toward the opposing tine, said pressure face having alternate longitudinal lands and grooves thereon, said wall being thicker in cross-section at the central portion in said face than at the marginal portion, said central portion being bowed inwardly and said marginal portion having a devious shape in cross-section to accommodate extensive movement toward the opposing tine without substantial outward bowing of said face under fluid pressure distension of said tube.

9. An article-conveyor distender for gripping the article in the conveying thereof, said distender comprising a chamber having a flexible article-gripping wall of resilient rubber-like material comprising an extensive flexible pressure face for exerting pressure compliantly against the article, and said wall having a movable marginal portion of devious shape in cross-section extending in the direction from the edge of said face towards the outer margins of said wall in the undistended condition of said distender and of a relatively straightened shape in cross-section in the distended condition of said distender to accommodate extensive outward movement of said face and flexure thereof without substantial outward bowing of said face under fluid-pressure distension of said wall.

10. An article-conveyor distender for gripping the article in the conveying thereof, said distender comprising a chamber having a flexible article-gripping wall of resilient rubber-like material and a reinforcing fabric element embedded therein, said wall comprising an extensive flexible

6

pressure face for exerting pressure compliantly against the article, and said wall having a movable marginal portion of devious shape in cross-section extending in the direction from the edge of said face towards the outer margins of said wall in the undistended condition of said distender and of a relatively straightened shape in cross-section in the distended condition of said distender to accommodate extensive outward movement of said face and flexure thereof without substantial outward bowing of said face under fluid-pressure distension of said wall.

11. An article-conveyor distender for gripping the article in the conveying thereof, said distender comprising a chamber having a flexible article-gripping wall including an extensive pressure face for exerting pressure against the article, said pressure face having grooves and lands for gripping the article, and said wall having a movable marginal portion of flexible material of devious shape in cross-section extending in the direction from the edge of said face towards the outer margins of said wall in the undistended condition of said distender and of a relatively straightened shape in cross-section in the distended condition of said distender to accommodate extensive outward movement of said face without substantial outward bowing of said face under fluid-pressure distension of said tube.

CHARLES W. LEGUILLON.
EDWIN B. KATZENMEYER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,819,947	De Lavaud	Aug. 18, 1931
2,127,730	Gunderson	Aug. 23, 1938
2,182,262	Pierce et al.	Dec. 5, 1939
2,208,282	Shelor	July 16, 1940
2,211,499	Fontaine	Aug. 13, 1940
2,213,629	Fontaine	Sept. 3, 1940
2,247,168	Fontaine	June 24, 1941
2,323,810	Fontaine	July 6, 1943
2,431,937	Hunter	Dec. 2, 1947
2,468,999	Pettler	May 3, 1949
2,503,698	Williams	Apr. 11, 1950