May 14, 1963 R. M. FORTSON ETAL 3,089,723

PORTABLE HANDLING IMPLEMENT

Filed Dec. 26, 1961

FIG. 1

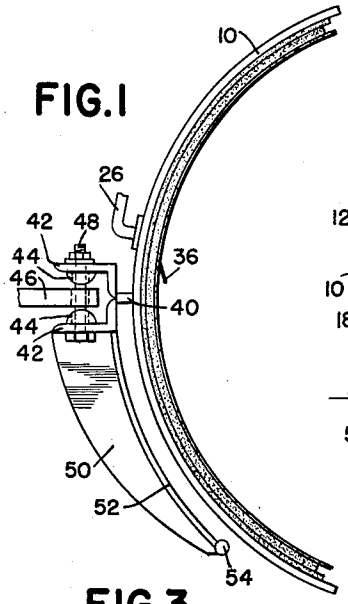


FIG. 2

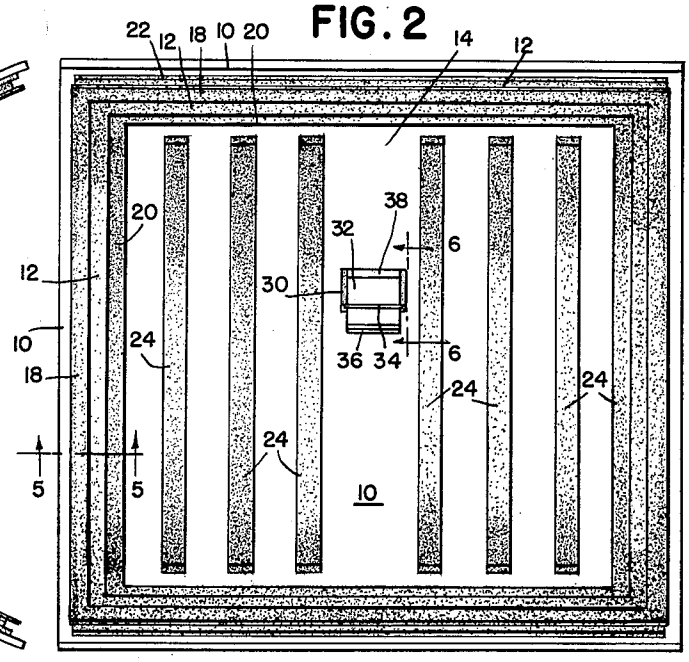
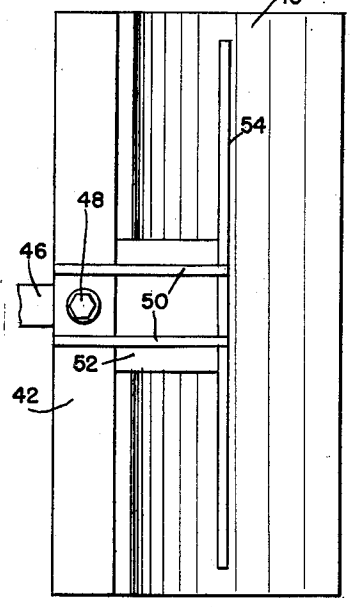


FIG. 3



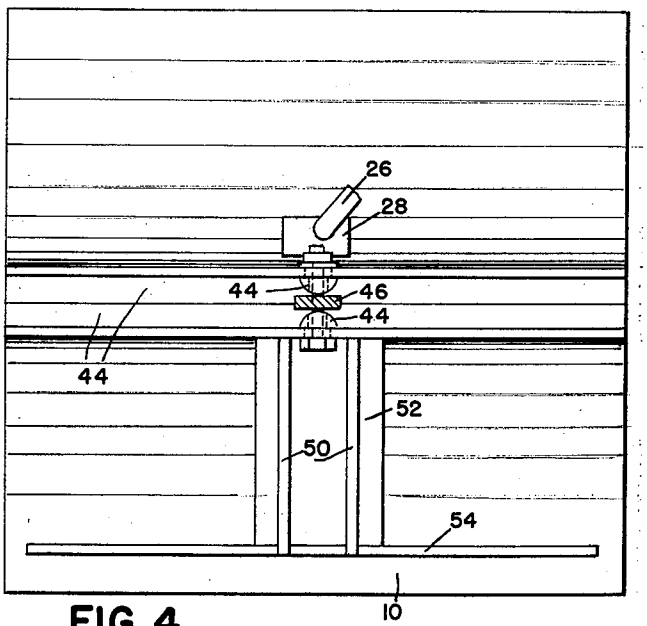


FIG. 4

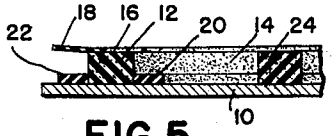


FIG. 5

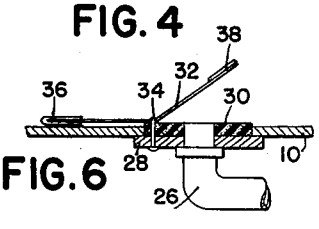


FIG. 6

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PORTABLE HANDLING IMPLEMENT

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13 Claims. (Cl. 294—65)

This invention relates to a portable handling implement and constitutes an advance in the art over such patents as those in the name of Karl P. Billner 2,455,650, dated December 7, 1948, and 2,578,220, dated December 11, 1951.

The portable handling implement contemplated by the present invention employs the use of vacuum and is eminently suited for the handling of large heavy rolls of paper of the types used by publishing establishments.

With respect to vacuum lifters of the prior art, the device of the present invention is more positive, provides a more rapid initial attachment to the load, involves less leakage and accordingly requires a smaller pump and supports a given load for a greater length of time following pump failure.

With respect to prior art lifters of the types employed for handling paper rolls, the present invention avoids the damage so frequently encountered with hydraulically actuated jaws, the present invention applies the force uniformly over a much larger surface of the load and accordingly, a relatively large lifting force can be applied without adversely affecting the load.

It is among the objects of the present invention to provide a portable handling implement comprising a plate, a compressible resilient elastomeric sealing gasket having interconnected cells secured to one surface of the plate and defining therewith an open chamber, a substantially incompressible air impervious resilient elastomeric flap adhesively secured under tension to the gasket and extending peripherally therebeyond, means communicating with the chamber through the plate for exhausting the same, and support means carried by the plate. Elastomeric means is preferably adhesively secured to the plate but free relative to the gasket to restrain lateral movement of the gasket and preferably such elastomeric means for restraining lateral movement of the gasket is located on opposite sides of the gasket. In accordance with the embodiment of the invention particularly intended for the handling of paper rolls, the plate is preferably arcuate and assumes a substantially cylindrical curvature. The plate is preferably flexible and resilient so as to adapt itself to rolls of varying sizes. In order to limit deflection of the plate, reinforcing means is preferably carried by the support. The support preferably includes coupling means providing a limited degree of freedom of movement of the implement in all directions relative to a load to be handled. The communicating means preferably includes a normally closed spring biased valve having an operator extending beyond the chamber for actuation by engagement with a load to be handled. The implement preferably includes compressible resilient elastomeric supports having interconnected cells secured to the surface of the plate within the chamber so as to avoid excessive deflection of any portion of the plate under operating conditions.

A more complete understanding of the invention will follow from a description of the accompanying drawings wherein:

FIG. 1 is an end elevation of a portable handling implement embodying the present invention;

FIG. 2 is a front elevation of the implement of FIG. 1;

FIG. 3 is a bottom plan view of the implement depicted in FIG. 1;

FIG. 4 is a rear elevation of the implement depicted in FIG. 1;

FIG. 5 is a fragmentary sectional elevation taken along line 5—5 of FIG. 2 on an enlarged scale; and

FIG. 6 is a fragmentary sectional elevation on an enlarged scale taken along line 6—6 of FIG. 2.

The portable handling implement comprises a plate **10** of arcuate configuration whose curvature may be substantially cylindrical. To the concave surface of the plate which may be composed of steel or such other material as will display flexibility and resilience, there is adhesively attached a compressible resilient elastomeric sealing gasket **12** defining with the plate an open chamber **14**. Adhesively secured to a portion of the surface **16** of the gasket remote from the plate is a substantially incompressible air impervious resilient elastomeric flap **18** attached to the gasket while the flap is under tension so that there will be a minimum of curling of the flap. The fact that the flap is placed under tension during its assembly constitutes a very important departure from the prior art disclosures and serves to close all gaps between the load and the implement prior to the time that the vacuum becomes fully effective between the implement and the load.

The gasket **12** is restrained from lateral movement by means of inner and outer elastomeric flaps **20** and **22** respectively, composed of substantially incompressible air impervious material adhesively secured to the concave surface of the plate **10** contiguous to the gasket **12** but not adhesively joined to the gasket so that there will be no interference with the compression of the gasket **12** under load. Whereas the flap **18** and the stops **20** and **22** are substantially incompressible and air impervious resilient elastomers such as "neoprene," the gasket **12** assumes the form of a sponge having relatively small interconnected cells enabling it to become highly compressed by the expulsion of air from the cells under load. The material constituting the gasket which may also be "neoprene" preferably has an average cell diameter of the order of 0.01 inch as compared with gasket materials previously proposed with much larger average cell diameters of the order of $\frac{1}{32}$ inch. The original thickness of the gasket **12** may be of the order of one inch whereas its thickness under load may be as little as one-half inch. In order to avoid any possible contact between the plate **10** and the load to be handled, intermediate supports **24** are secured to the concave surface of the plate **10** within the chamber **14**, their ends terminating short of the gasket **12** to assure freedom of fluid flow from the chamber upon the application of a subatmospheric pressure through a tubular connector **26** extending through the plate **10**. The intermediate supports **24** are composed of sponge like the gasket **12** and their thickness is substantially equal to that of the gasket **12**.

As shown in FIG. 6, the coupling **26** is secured, as by welding to a pad **28** which is in turn secured, as by welding, to the convex surface of the plate **10**. A sponge elastomeric seat **30** surrounds the fitting **26** within the chamber **14** for cooperation with a leaf spring type of valve **32** pivotally positioned by a rod **34**. The valve **32** is shown in its open position in FIG. 6 while in FIG. 2 it is depicted in its normal closed position. When the valve is closed, its left end **36** as viewed in FIG. 6 projects forwardly for engagement with the load as the implement is moved into position. Such engagement causes the operator to move towards the plate **10** so as to move the right end **38**, as viewed in FIG. 6 away from the seat **30** to permit air within the chamber **14** to be removed as result of the reduced pressure produced by the vacuum

pump, not shown. Due to its composition, the valve **32** possesses the properties of a spring so as to return to its closed position whenever the operator end **36** is free to move away from the plate. Both ends of the valve **32** are covered with a thin layer of elastomeric material adhesively secured thereto so as to avoid damage to the load being handled.

Substantially along the center line of the convex surface of the plate **10** there is welded a rib **40** to which, in turn, a pair of angles **42** are welded. Substantially centrally of the angles **42**, a pair of hemispheres **44** are welded so as to admit between them a lifting element such as the tongue **46** of a lift truck. In order to provide freedom of movement, to a limited degree, in all directions, it is contemplated that the tongue **46** contain an opening slightly exceeding that of a coupling bolt **48** whereas the hemispheres **44** contain openings substantially larger than the diameter of the coupling bolt. In this manner, when the implement is brought into contact with the load, the implement will adjust itself to the configuration and position of the load without requiring excessive manipulation of the truck.

Depending from the lower angle **42** as shown in FIG. 1, there are two arcuate ribs **50** welded thereto and welded to an arcuate apron **52**. At the lower ends of the arcuate ribs **50** and the apron **52** there is welded a rod **54** extending substantially throughout the length of the plate **10** so as to prevent excessive deflection of the plate **10**. Inasmuch as the plate **10** is somewhat flexible so as to adapt itself to cylindrical objects of varying diameter, it will follow that if the permissible deflection of the plate were not limited in some fashion, there would be danger of its becoming excessively flattened to a degree that might produce leakage and loss of the load.

Inasmuch as the gasket **12**, intermediate supports **24** and stops **20** and **22** are all composed of elastomeric materials, the implement as an entirety is relatively uniformly flexible so as to conform most readily with the loads to be handled. Since the flap **18** is stretched so as to be applied under tension to its ultimate position, there is no tendency for it to become corrugated or curled so that there is a minimum danger of leakage during the initial stages of application of the implement to a load.

Whereas only one specific form of the invention has been described with reference to the accompanying drawings, variations suggesting themselves to those skilled in the art are contemplated within the scope of the appended claims.

We claim:

1. A portable handling implement comprising a plate, a compressible resilient elastomeric sealing gasket having interconnected cells secured to one surface of said plate and defining therewith an open chamber, a substantially incompressible air impervious resilient elastomeric flap adhesively secured under tension to said gasket and extending peripherally therebeyond, means communicating with said chamber through said plate for exhausting the same, and support means carried by said plate.

2. A portable handling implement according to claim 1 including elastomeric means secured to said plate but free relative to said gasket restraining lateral movement of said gasket.

3. A portable handling implement according to claim 1 including elastomeric means secured to said plate on opposite sides of said gasket and free relative to said gasket restraining lateral movement of said gasket.

4. A portable handling implement according to claim 1 wherein said plate is arcuate.

5. A portable handling implement according to claim 1 wherein said plate is substantially cylindrical.

6. A portable handling implement according to claim 1 wherein said plate is flexible and resilient.

7. A portable handling implement according to claim 1 wherein reinforcing means carried by said support means limits deflection of said plate.

8. A portable handling implement according to claim 1 wherein said support includes coupling means providing a limited degree of freedom of movement of said implement in all directions relative to a load to be handled.

9. A portable handling implement according to claim 1 wherein said communicating means includes a normally closed spring biased valve having an operator extending beyond said chamber for actuation by engagement with a load to be handled.

10. A portable handling implement according to claim 1 including compressible resilient elastomeric supports having interconnected cells secured to said surface of said plate within said chamber.

11. A portable handling implement comprising an arcuate plate, a compressible resilient elastomeric sealing gasket having interconnected cells secured to one surface of said plate and defining therewith an open chamber, an air impervious resilient elastomeric flap adhesively secured to said gasket and extending peripherally therebeyond, means communicating with said chamber through said plate for exhausting the same, support means carried by said plate, and reinforcing means carried by said support means limiting deflection of said plate.

12. A portable handling implement according to claim 11 wherein said plate is substantially cylindrical.

13. A portable handling implement according to claim 11 wherein said reinforcing means is normally spaced from said plate.

References Cited in the file of this patent

UNITED STATES PATENTS

2,578,220 Billner ---------- Dec. 11, 1951