Feb. 18, 1958 K. W. HORTON 2,823,948

GRAB FOR LIFTING HOLLOW OBJECTS

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Fig. 1.

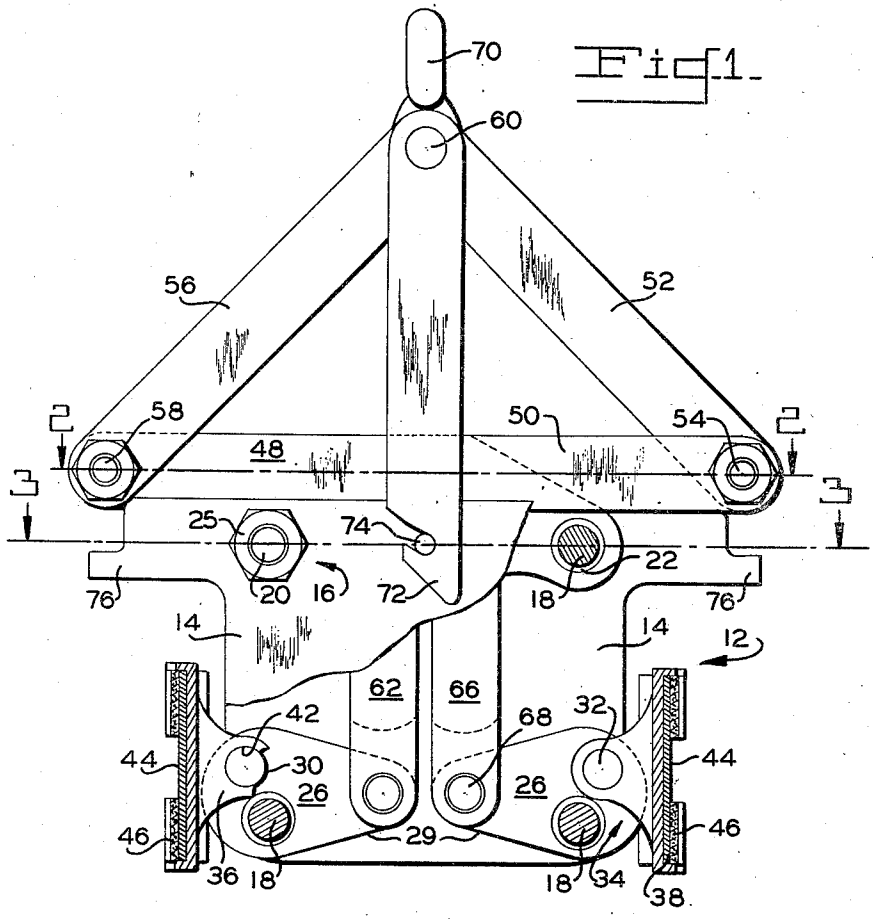

Fig. 2.

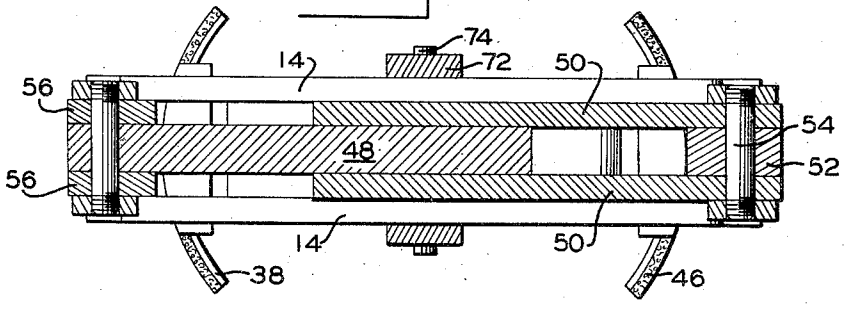

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Fig. 3.

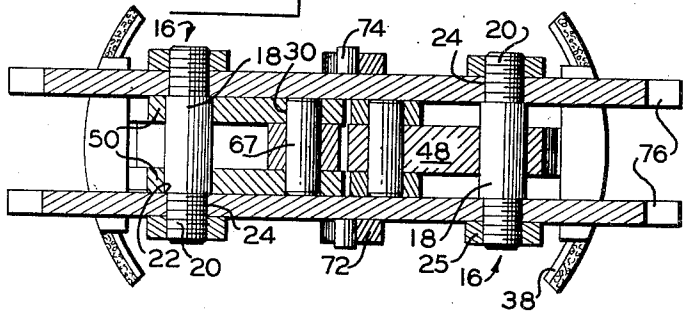
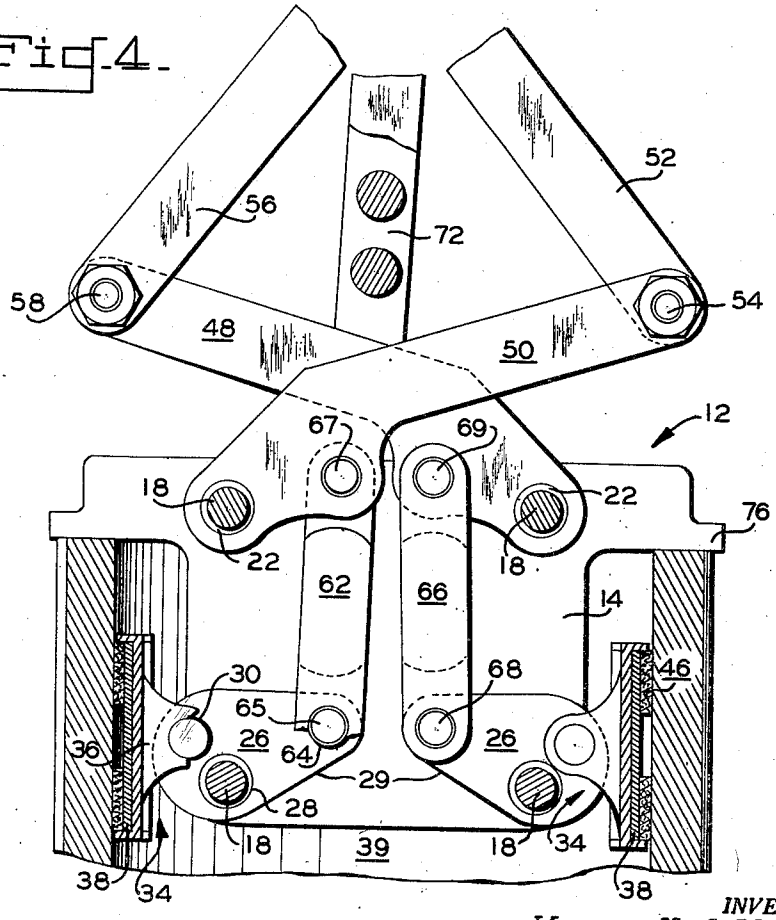


Fig. 4.



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United States Patent Office 2,823,948 Patented Feb. 18, 1958

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GRAB FOR LIFTING HOLLOW OBJECTS

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Application December 21, 1955, Serial No. 554,596

2 Claims. (Cl. 294—97)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

This invention relates to lifting devices and more particularly to a grab which grips a load by frictional means.

It is an object of this invention to provide a grab for lifting hollow objects by frictional means.

It is another object of this invention to provide a grab for lifting hollow objects where the size and surface character of the interior progressively change.

It is a further object of this invention to provide a grab having a pair of internally expanding jaws which are actuatable to resiliently and frictionally grip the interior surface of a hollow object by the weight of such object.

The specific nature of the invention as well as other objects and advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawings in which:

Fig. 1 is a partially cross-sectional side view of the grab locked in unloaded condition showing the arrangement of the lever mechanism;

Fig. 2 is a view taken along line 2—2 of Fig. 1;

Fig. 3 is a view taken along line 3—3 of Fig. 1; and

Fig. 4 is a partially cross-sectional side view showing the grab lifting a hollow cylinder.

Shown in the Figs. is a grab **12** having a pair of substantially rectangular side plates **14** which are secured in spaced apart position by four stud bolts **16** which are mounted through such side plates at each corner. Each of the stud bolts **16** is provided with a cylindrical body portion **18**, which acts as a bearing for a member pivotally mounted thereon as hereinafter noted, and a threaded portion **20** at each end. Threaded portions **20** are of smaller diameter than body portion **18** and extend from shoulders **22** formed at the junctions thereof with such body portion through suitable holes **24** in side plates **14**. Nuts **25**, threadably mounted on threaded portion **20**, press side plates **14** against shoulders **22** thereby fixedly securing such plates in position.

An elongated bell crank lever **26** is pivotally mounted on the body portion **18** of each of the two stud bolts **16** mounted through the bottom sides of side plates **14** by means of a cylindrical hole **28** through the lower portion of one end of such lever. Bell crank levers **26** are so mounted that the free ends **29** thereof extend toward each other and are of such length that such free ends are spaced apart when such levers are longitudinally aligned. Provided transversely through each of the bell crank levers **26** above hole **28** is a bore **30** which receives a pin **32** upon which there is pivotally mounted, as hereinafter described, a jaw member **34**. Whereby, rotation of the free ends **29** upwardly causes the jaw member **34** to be moved outwardly.

Each of the jaw members **34** is comprised of a saddle portion **36** which is received between side plates **14** and a rectangular shoe portion **38** which is symmetrically mounted to one end of such saddle portion outside of side plates **14** and is engageable with the inside surface of a

hollow object such as cylinder **39**. The free ends of each of the saddle portions **36** are bifurcated to receive ends **29** of the bell crank levers **26** and a hole **42** is provided in each of such bifurcated portions to rotatably receive the pin **32**. Shoe portions **38** are fabricated from spring steel and each is provided with an arcuate face portion **44** which is contactable with the inside surface of cylinder **39**. Each of the face portions **44** is lined with a material **46**, such as brake lining, which has a high frictional coefficiency to frictionally grip the inside surfaces of the object to be lifted. The face portions **44** have a larger radius than that of the inside surface of cylinder **39** or, if such grab is to be used for lifting hollow objects in which the inside surfaces are straight, has a slightly concave contour. Whereby, when the jaw members **34** are pressed against the inside surfaces of the object to be lifted, the segmental ends of the lining **46** on the face portions **44** contact such inside surface first with such shoe springing inwardly for full circumferential contact of the lined face portions with the inside surface when pressure is applied by such jaw members. As jaw members **34** are pivotally mounted to bell crank levers **26**, they are self-centering when actuated against the interior surface of cylinder **39** and thereby the wear of lining **46** is reduced.

An arm **48** is mounted at one end to the stud bolt **16** which is mounted through the top right corner of the side plates **14**. A pair of arms **50**, similar to arm **48** but one-half as thick, are pivotally mounted in juxtaposition on the stud bolt **16** which is mounted through the top left corner of the side plates **14**. Arm **48** is arranged to cross between the pair of arms **50** with the free ends of such arms **48** and **50** extending beyond the side plates **14**. One end of a bar **52** is received between the free ends of the arms **50** and is hingedly connected thereto by a bolt **54**. A pair of identical bars **56** is juxtaposed on opposite sides of bar **52** with one end of such bars being hingedly joined to the free end of arm **48** by a bolt **58**. The free ends of bars **56** and bar **52** meet a distance above side plates **14** when arms **48** and **50** are longitudinally aligned and are hingedly joined by a pin **60**.

The left one of the bell crank levers **26** is connected to the arms **50** by means of a link **62** which is bifurcated at one end to receive end **29** of such bell crank lever and is reduced in cross section at the opposite end so as to be received by such arms. A cylindrical hole **64** transverses link **62** and bell crank lever **26** to provide a mounting hole for a pin **65**. Link **62** is hingedly connected by a pin **67** to arms **50** at approximately the same distance from the top left one of the stud bolts **16** as pin **65** is from the bottom left one of the stud bolts **16**.

The right one of the bell crank levers **26** is connected to arm **48** by means of a link **66** which is bifurcated at one end to receive end **29** of such bell crank lever and at the opposite end to receive arm **48**. Link **66** is hingedly mounted to the right one of bell crank levers **26** by means of a transverse pin **68** and to arm **48** by a pin **69** at approximately the same distance from the top right one of the stud bolts **16** as pin **68** is from the bottom right one of the stud bolts **16**.

Also mounted to pin **60** is a yoke **70** which is engageable by a lifting device (not shown), such as a hoist, and a pair of hooks **72** which are pivotally mounted on each end of such pin. Each one of the hooks **72** is engageable with a lug **74** extending from the adjacent side plate **14** when arms **48** and **50** are longitudinally aligned. Whereby, the jaw members **34** are retracted toward each other while grab **12** is being transported, ready for insertion into cylinder **39**.

Lips **76** extend from the right and left sides of the uppermost portion of side plates **14** to engage the upper side of cylinder **39** and rest thereon while hooks **72** are

disengaged from lugs 74. Lips 76 thereby limit entrance of grab 12 into the interior of cylinder 39.

When grab 12 is in place with lips 76 resting on the top of cylinder 39 and hooks 72 disengaged from lugs 74, and the lifting device is actuated upwardly, the upward lift on yoke 70 against the weight of the grab causes bars 52 and 56 and the pivotally connected arms 48 and 50 to straighten out vertically. As arms 48 and 50 are rotated towards a vertical position, the jaw members 34 pivotally mounted thereto are moved laterally outward into contact with the interior surface of cylinder 39.

It will be noted, referring to Figs. 1 and 2, that in respect to arms 50, the distance between the mounting stud bolt 16 and pin 67 is shorter than that between such stud bolt and pin 54 and that, in respect to arm 48, the distance between the mounting stud bolt and pin 69 is shorter than that between such stud bolt and pin 58 for a mechanical advantage. Also, in respect to the bell crank levers 26 the distance between the mounting stud bolts 16 therefor and the pins 32 is less than that between such stud bolts and the pins 65 and 68 for additional mechanical advantage. Whereby, the force with which jaw members 34 press against the interior surface of cylinder 39 is increased many times over that exerted upwardly against arms 48 and 50 so that the force of the weight of such cylinder is, while being lifted, multiplied several times and such increased force translated to lateral pressure of such jaw members against the interior of cylinder 39. The lining material 46 on face portions 44 assures nonslipping contact between grab 12 and cylinder 39.

It is obvious that by being flexible shoe portions 38 are adaptable to variations in the character of the contacting surface. Also, that the combined lateral movements of jaw members 34 make grab 12 adaptable to interior holes of various diameters. This is advantageous when grab 12 is used to transport in a production line a heavy hollow object wherein the interior surface progressively changes from a rough to a smooth state and wherein the diameter of the interior hole progressively increases.

From the foregoing, it is clearly apparent that there is herein provided a grab for lifting hollow objects which is rugged in construction, simple in operation and which is adaptable to lifting hollow objects of changing interior dimensions and surface characteristics.

Although a particular embodiment of the invention has been described in detail herein, it is evident that many variations may be devised within the spirit and scope thereof and the following claims are intended to include such variations.

I claim:

1. For a lifting device, a grab for releasably gripping the inside of a hollow object to be hoisted including a pair of rectangular side plates vertically insertable into the object and being fixedly joined in spaced lateral juxtaposition by stud bolts mounted between each of the top corners and each of the bottom corners of said side plates, lips extending outwardly from said top corners for engagement with the top of the object for limiting entrance of said grab thereinto, a bell crank lever pivotally mounted on each of said stud bolts mounted between said bottom corners, a jaw member pivotally mounted for a mechanical advantage to one end of each one of said bell crank levers for actuation thereby against the inside of the object with a force greater than that applied to said bell crank lever, a resilient shoe portion on each of said jaw members, a lined face portion on each of said shoe portions resiliently and frictionally engageable with the inside of the object when actuated thereagainst by said bell crank levers, and lever means engageable by the lifting device for hoisting said grab, said lever means being pivotally mounted to said bell crank levers for simultaneous actuation of said jaw members against the inside of the object with a greater force than that applied by the lifting device to said lever means when hoisting said grab.

2. For a lifting device, a grab for releasably gripping the inside of a hollow object to be hoisted including a pair of rectangular side plates insertable vertically into the object and being fixedly joined in spaced lateral juxtaposition by stud bolts mounted between each of the top corners and each of the bottom corners of said side plates, lips extending outwardly from said top corners for engagement with the top of the object for limiting entrance of said grab thereinto, a bell crank lever pivotally mounted on each of said stud bolts mounted between said bottom corners, a jaw member pivotally mounted for a mechanical advantage to one end of each one of said bell crank levers for actuation thereby against the inside of the object with a force greater than that applied to said bell crank levers, a resilient shoe portion on each of said jaw members, a lined face portion on each of said shoe portions resiliently and frictionally engageable with the inside of the object when actuated thereagainst by said bell crank levers, an arm pivotally mounted on each of said stud bolts mounted between said top corners and disposed in cross relationship so that the free ends thereof are adjacent the opposite ones of said top corners, a bar pivotally mounted at one end to said free end of each one of said arms and at the opposite end to the other one of said bars by means of a pin, a link pivotally mounted at one end to the free end of each one of said bell crank levers and pivotally mounted at the opposite end to the adjacent one of said arms so that said arms apply a greater force to said links than is applied thereto, a yoke pivotally mounted on said pin and being engageable by the lifting device for hoisting said grab, and hook means pivotally mounted on said pin for releasable engagement with lug means on said side plates for releasably locking said jaws in contracted positions for insertion into the hollow object when said grab is transported by the lifting device.

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