

[72] Inventor **Raymond H. Richardson**
Chicago, Ill.
 [21] Appl. No. **773,115**
 [22] Filed **Nov. 4, 1968**
 [45] Patented **Feb. 2, 1971**
 [73] Assignee **Interlake Steel Corporation**
Chicago, Ill.
a corporation of New York

2,518,065	8/1950	Reilley et al.	200/61.44
2,822,436	2/1958	Towle.....	200/61.41
3,139,994	6/1964	Chasar	214/16.42
3,232,455	2/1966	Fountain et al.....	214/16.42
3,339,040	8/1967	Vilkas	200/61.41

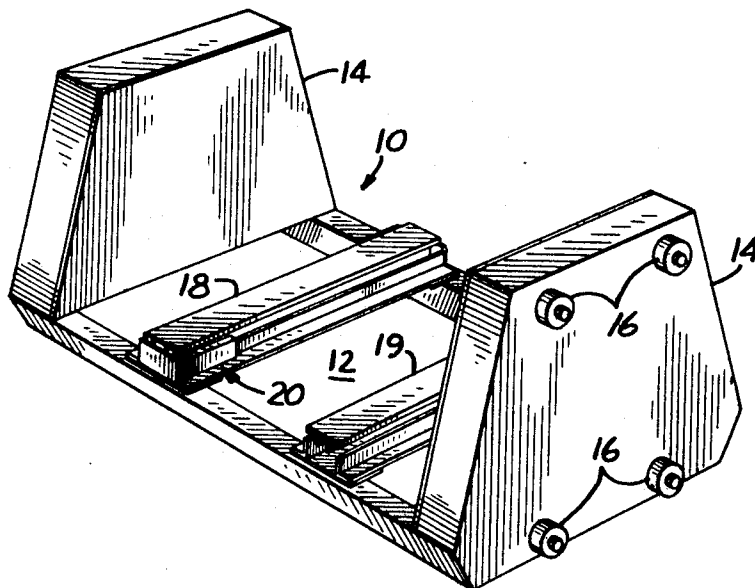
Primary Examiner—H. O. Jones
 Assistant Examiner—Robert A. Vanderhye
 Attorney—Molinare, Allegretti, Newitt & Witcoff

[54] **LOAD PRESENCE DETECTOR LEVER MOUNTED FOR PIVOTAL AND LONGITUDINAL MOVEMENT**
16 Claims, 5 Drawing Figs.

[52] U.S. Cl..... **200/61.44,**
 214/16.4; 200/61.41
 [51] Int. Cl..... **H01h 3/16**
 [50] Field of Search..... 200/61.41,
 61.42, 61.44; 340/280, 282, 421; 214/16.42, 16.4
 (Inquired), 16.14 (Cursory)

[56] **References Cited**
UNITED STATES PATENTS
 2,490,217 12/1949 Keating 200/61.44

ABSTRACT: A load presence detector for a power-operated load handling fork assembly comprises a rotatable, longitudinally displaceable lever member. When the power-operated fork is extended, the lever member is rotated about a pivot axis and, if the storage space into which it is desired to deposit the load being carried by the forks is already occupied by another load, the rotated lever member contacts the load in the space and moves in a longitudinal direction to terminate power to the fork. If the space is unoccupied, the lever member rotates further about its pivot to allow the fork to deposit the load in the unoccupied space.



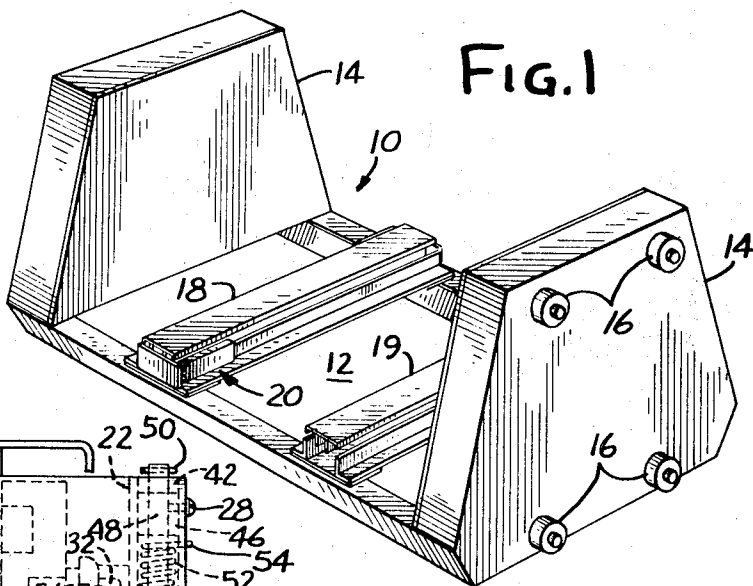


FIG. 1

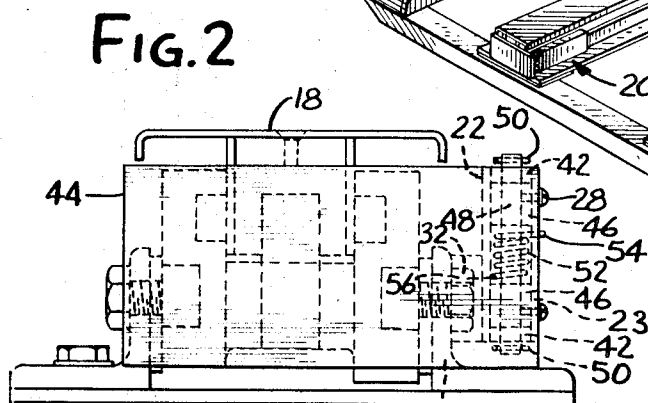


FIG. 2

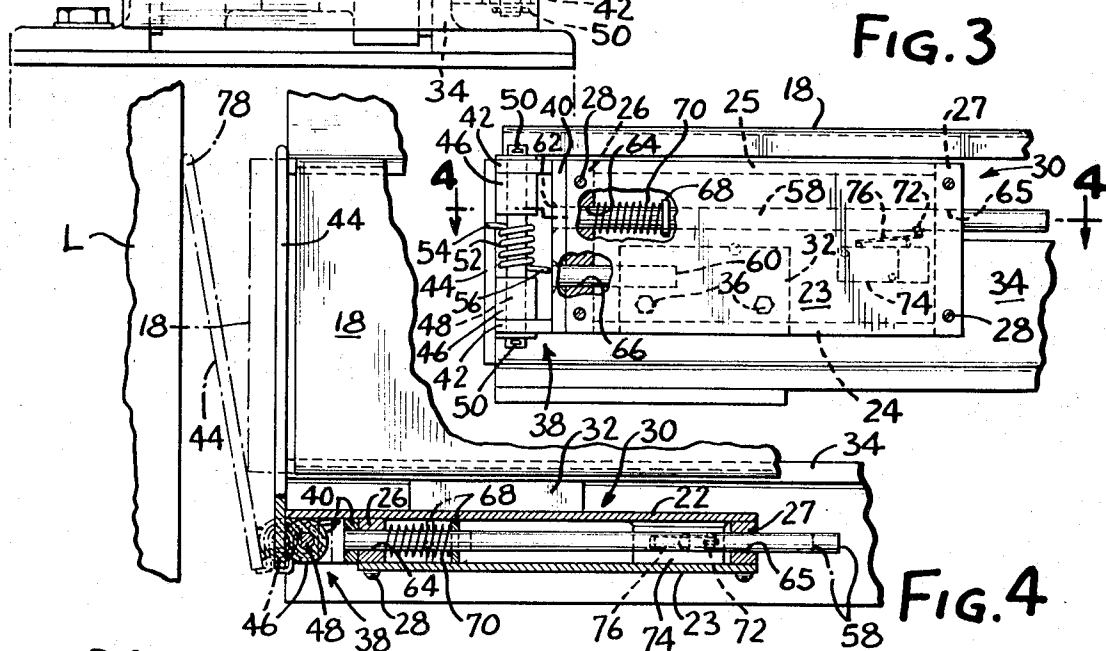


FIG. 3

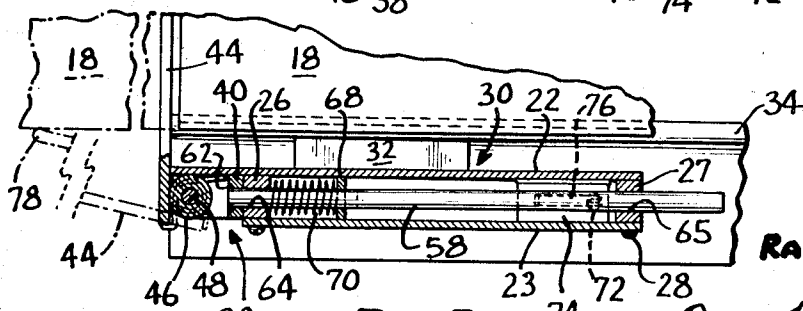


FIG. 4

FIG. 5

INVENTOR
RAYMOND H. RICHARDSON

by: Bair, Freeman & Molinare
ATTYS.

LOAD PRESENCE DETECTOR LEVER MOUNTED FOR PIVOTAL AND LONGITUDINAL MOVEMENT

BACKGROUND OF THE INVENTION

This invention relates to a load presence detector and more particularly, to a load detector for use in a power-operated load handling fork assembly for detecting the presence of a load in a storage space.

Where load carriers are employed to store and retrieve loads in extensive storage area complexes, and particularly where loads are to be stored by remote control in selected areas of the complex, it is desirable to provide a protective device to prevent the insertion of a load in an already occupied space. If such protection is not provided, damage to the already stored load and the load desired to be stored, as well as the load carrier assembly itself, will generally result particularly since the load handling forks are usually power operated and the loads are frequently of substantial mass.

The load presence detector constructed in accordance with the principles of my invention reliably and rapidly mechanically detects the presence or absence of a load in the storage space to avoid the insertion of a second load into the space if the space is already occupied and is operated by the movement of the load carrying forks toward the space. When the storage space is unoccupied, the load detector allows unhampered movement of the load to be stored into the unoccupied space. The load presence detector constructed according to the principles of my invention is extremely simple in construction and operation and may readily be incorporated into preexisting load handling fork assemblies without the necessity of a major reconstruction of same. The load presence detector of my invention is also durable in operation and positively acts to terminate the power to the forks of the load handling assembly to cease movement of the forks into the storage space when the space is already occupied. The load detector of my invention is mounted on the load carrying platform itself and is not carried back and forth by the handling forks during operation as in prior load detector constructions, and thus the possibility of damage to the load detector and its electrical connectors is substantially reduced.

SUMMARY OF THE INVENTION

In one principal aspect, the load presence detector constructed in accordance with the principles of my invention comprises an elongated lever member which is mounted both for rotation and longitudinal movement by the forks. The lever member rotates about a pivot axis for contacting a load if present in the space and moves longitudinally when the lever member contacts a load in the storage space. Signal means is provided which is responsive to the longitudinal movement of the lever member to signal the presence of the load in the storage space.

In another principal aspect, a load depositing assembly constructed in accordance with the principles of my invention comprises a load presence detector which is mounted separately from an extendible load handling arm. Extension of the arm operates to direct a feeler toward the storage space to actuate a signal means if the feeler means senses the presence of a load in the space.

These and other objects, features and advantages of the present invention will be more clearly understood through a consideration of the following detailed description.

BRIEF DESCRIPTION OF THE DRAWING

In the course of this description, reference will frequently be made to the attached drawing in which:

FIG. 1 is an overall view of a power-operated, extendible fork load handling assembly which includes a preferred embodiment of load presence detector of my invention;

FIG. 2 is an end elevation view of the preferred embodiment of one load presence detector and one of the power operable extendible load handling forks;

FIG. 3 is a partially cut away side elevation view of the preferred embodiment of load presence detector and the fork;

FIG. 4 is a partially cross sectioned plan view of the load presence detector and fork taken along line 4-4 of FIG. 3, showing the operation of the load presence detector in detecting the presence of a load in the storage space; and

FIG. 5 is a partially cross sectioned plan view of the load presence detector and fork taken along line 4-4 of FIG. 3, showing the operation of the load presence detector when the storage space is unoccupied.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, by way of example a suitable load carrying platform 10 is shown which comprises a horizontal bed 12 and a pair of vertically upstanding end panels 14 having rollers 16 mounted thereon for guiding the platform in vertical movement with respect to a pair of vertical straddling masts (not shown). The masts are mounted on a suitable trolley base (not shown) for movement of the load carrying platform longitudinally up and down the aisles of the storage area, the platform thus being both vertically and horizontally moveable so that it may be selectively positioned with respect to selected storage bins or spaces in storage racks in the storage area. The specific load carrier structure for effecting the vertical and longitudinal movement of the platform 10 does not form a part of this invention and therefore will not be described in detail herein. Mounted on the bed 12 of the load carrying platform, are a pair of extendible power-operated forks 18 and 19 which are adapted to telescopically extend either to the right or left of the load carrying platform to either carry a load which is located on the platform into a selected storage bin or space for deposit therein or to remove a load from the bin or space to the load carrying platform. To prevent extension of the forks into a storage bin or space which is already occupied, one or more load presence detectors 20 are located adjacent ends of the forks 18 and 19 such that the load presence detectors are operable when the forks are extended in either direction.

The load presence detector 20 comprises a pair of spaced vertical plates 22 and 23, a pair of horizontal plates 24 and 25, and a pair of end plates 26 and 27 affixed together, as by screws 28, to form a hollow housing generally 30. A smaller plate 32 mounts the housing to the angle iron assembly 34 which carries the extendible forks 18 adjacent an end of the fork, plate 32 being bolted to plate 22 and the angle iron 34 by bolts 36. The housing 30 is thus stationarily attached adjacent the end of the power extendible fork 18 and extends in a direction substantially parallel to the axis of the fork.

A moveable head 38 is provided which includes, a plate 40 which lies substantially parallel to end plate 26 and normally abuts the outer surface of the end plate. A pair of perpendicular flanges 42 are attached to plate 40 and extend forward in parallel relationship to each other from each distal end of the plate, the opposite ends lying substantially in the plane of the end of the fork 18. A lever plate 44 lies across the end of the fork 18 and a pair of cylindrical members 46 are mounted on the inner face at one end of the lever plate and extend into the space between the flanges 42. Each of the flanges 42 and the cylindrical members 46 are apertured to define an elongated passage through which a pivot pin 48 is journaled pivotally mounting the lever plate 44 to the head 38. The pivot pin 48 is held in position by cotter pins 50 or the like through each end of the pin. The cylindrical members 46 are spaced from each other and a resilient coil spring 52 is carried by the pivot pin 48, the spring having one end 54 extending around the edge of the lever plate 44 and the other end 56 bearing against the face of the somewhat longer housing plate 22. The spring thus operates to normally urge the lever plate 44 into overlying relationship with the end of the fork 18 in a direction substantially normal to the axis of the fork.

A pair of elongated cylindrical shafts 58 and 60 are fixedly attached to the plate 40, as by welding at 62. Shaft 58 slideably extends through an aperture 64 formed in end plate 26, through the housing 30 and out through an aperture 65 formed in end plate 27 and shaft 60 slideably extends through

an aperture 66 formed in end plate 26 and into the housing 30. A shoulder 68 is fixed to shaft 58 within the housing 30 and a resilient coil spring 70 is carried on the shaft between the shoulder and the end plate 26, normally urging the shaft 58 and the associated head 38 to the right, as viewed in FIGS. 3 —5. The shaft 58 includes a recess 72 and an electrical switch 74, located in the power circuit of the power operated forks, is mounted within the housing, the actuating arm 76 of the switch entering the recess 72 when the shaft 58 and head 38 are positioned in their extreme right position, as viewed in FIGS. 3 —5.

Referring particularly to FIGS. 4 and 5, the operation of the presence detector 20 is shown. Let it be assumed that a load is located on the forks 18 and 19 of the load carrying platform 10 and the platform has been positioned adjacent the ordered storage space in preparation for deposit of the load on the platform in the storage space. Power is supplied to the forks and the forks commence extension toward the storage space. Referring particularly to FIG. 4, as fork 18 is extended, it contacts the lever plate 44 rotating the lever plate about its pivot pin 48 from its normal angular position, as shown by the solid lines, to the dot and dash line position. If a load L is already positioned in the storage space, the lever plate 44 will rotate only until its end 78 contacts the load L. As the fork 18 continues to move toward the storage space, the fork will continue to exert a force on the lever plate 44 intermediate its ends and cause the plate to commence pivoting about the contacting end 78 of the lever plate, overcoming the spring pressure exerted by spring 70 to pull the head 38 longitudinally out of its abutting position with end plate 26. As the head 38 is pulled longitudinally outward, the shaft 58 also moves to the left, as viewed in FIG. 4, moving the recess 72 out of engagement with the actuating arm 76 of the switch 74, causing the switch to terminate the power to the power operating mechanism of the fork. When the power is terminated, the forks 18 and 19 cease further movement preventing collision of the forks and their load with the load L already occupying the storage space. The shafts 58 and 60 act to guide the longitudinal movement of the head 38 and prevent tilting of the head with respect to end plate 26. When the fork 18 is retracted, spring 52 urges the lever plate 44 back to its normal solid line position, as viewed in FIG. 4, and spring 70 returns the head 38 to its abutting position against end plate 26. Thus, the shaft 58 moves back to the right and the actuating arm 76 of the switch 74 is realigned with the recess 72 and the forks resume normal operation.

If the space is unoccupied, the extension of the fork 18 operates to merely rotate the lever plate 44 from its normal solid line position to an out-of-the-way position, as shown by the dot and dash lines in FIG. 5. In the last mentioned out-of-the-way position, the extension of the fork 18 does not produce longitudinal movement of the head 38 since the end 78 of the lever plate 44 does not contact the fixed load L to provide the requisite mechanical force couple which is necessary to produce longitudinal displacement of the head. Thus the power to the forks continues uninterrupted.

Where the forks 18 and 19 are to be extended into the space to remove and retrieve a load therefrom, the platform 10 and its forks will be positioned at a somewhat lower elevation to enable the forks to pass beneath the stored load. Thus, the lever plate 44 will not contact the load to be retrieved and will merely rotate to the out-of-the-way position as shown in FIG. 5 without interrupting power to the forks.

It should be understood that the embodiment of the invention which has been described is merely illustrative of one of the applications of the principles of the invention. Numerous modifications may be made by those skilled in the art without departing from the true spirit and scope of the invention.

I claim:

1. A load presence detector for detecting the presence of a load in a load storage space comprising:
an elongated lever member;

mounting means pivotally mounting said lever member, said lever member being rotatable about said pivotal mounting in response to a force on said lever member intermediate its ends for contacting a load if a load is present in the space;

longitudinal movement means carried by said lever member for effecting longitudinal movement of said lever member when the lever member contacts the load; and

signal means responsive to the longitudinal movement of said lever member for signalling the presence of the load in the storage space.

2. The load detector of claim 1 wherein said lever member is rotatable about said pivotal mounting by said force from a first normal angular position to a second angular position in which said lever member contacts the load occupying the space and to a third angular position when the space is unoccupied.

3. The load detector of claim 2 including spring means normally urging said lever member into said first normal angular position.

4. The load detector of claim 1 wherein said longitudinal movement means comprises:

head means, said lever member being mounted on said head means;

a stationary member;

an elongated shaft attached to said head means, said shaft being axially slideably carried by said stationary member; and

urging means normally urging said head means toward said first longitudinal position.

5. The load detector of claim 4 wherein said urging means comprises a spring carried by said elongated shaft normally urging said shaft and the associated head means in a direction in which the signal means is not actuated.

6. The load detector of claim 4 including a second elongated rod attached to said head means and slideably carried by said stationary member.

7. The load detector of claim 4 wherein said signal means is responsive to the axial sliding movement of said elongated rod to signal the presence of the load in the storage space.

8. The load detector of claim 1 wherein said signal means terminates the force exerted on the lever member upon said longitudinal movement of the lever member.

9. The load detector of claim 8 wherein said signal means comprises an electric switch.

10. A load depositing assembly having a stationary portion and at least one load handling arm extendible relative to said stationary portion to position a load in a storage space, comprising:

a load presence detector mounted separately from said arm on said stationary portion, said load presence detector including a feeler means for sensing the loading condition of the storage space, at least a part of the feeler means being directed toward the storage space by the arm as the arm is extended; and

signal means associated with said feeler means, said signal means being actuated by the feeler means when the feeler means senses the presence of a load in the storage space.

11. The assembly of claim 10 wherein said feeler means comprises a lever member which is mounted adjacent said arm for rotational movement in response to the extension of said arm and for longitudinal movement in response to the presence of a load in the storage space, and said signal means is actuated in response to the longitudinal movement of said lever member.

12. The assembly of claim 10 wherein said feeler means comprises an elongated rigid lever member normally positioned in a first angular position across the extendible end of said arm and mounting means mounting said lever member for rotation by the arm about a pivot axis substantially normal to the longitudinal axis of said arm from said first angular position to second and third angular positions and for longitudinal movement substantially parallel to the axis of the arm by the

arm from a first normal longitudinal position in response to contact of said lever member with a load already present in the storage space when said lever member is rotated to said second angular position, said signal means being actuated by said longitudinal movement of said lever member for signalling the presence of the load in the storage space. 5

13. The assembly of claim 12 including urging means normally urging said lever member into said first angular position and first longitudinal position.

14. The assembly of claim 12 wherein said load detector 10 further comprises:

a longitudinally moveable head moveable in response to longitudinal movement of said lever member, said lever member being rotatably mounted on said head;

a stationary member having an aperture defined therein; and

an elongated shaft attached to said head and slideably journaled through said aperture for longitudinal movement with said head, said signal means being responsive to said longitudinal movement of said shaft.

15. The assembly of claim 12 wherein said lever member is in said first longitudinal position when said lever member is positioned in said first and third angular positions.

16. The assembly of claim 10 wherein said signal means discontinues the power to said arm to stop the extension of said arm when said signal means is actuated.

15

20

25

30

35

40

45

50

55

60

65

70

75

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,560,678

Dated Feb. 2, 1971

Inventor(s) Raymond H. Richardson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 30, "said", second occurrence, should read -- a -- .

Signed and sealed this 11th day of April 1972.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patent