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Merchant et al.

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[54] **MEANS FOR HANDLING FREIGHT CONTAINERS AND THE LIKE**

[75] Inventors: **Thomas Harry Merchant**, Wolverhampton; **Peter Thomas Ward**, Lichfield; **Richard Terence**, Wolverhampton, all of England

[73] Assignee: **Rubery, Owen & Co. Limited**, Darlaston, England

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[30] **Foreign Application Priority Data**

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Sept. 19, 1970 Great Britain 44,743/70

[52] **U.S. Cl.** ..... **294/81 SF**, 294/67 R
[51] **Int. Cl.** **B66c 1/00**
[58] **Field of Search** ..... 212/39 R; 294/67 R, 294/67 DA, 81 SF; 248/407–409

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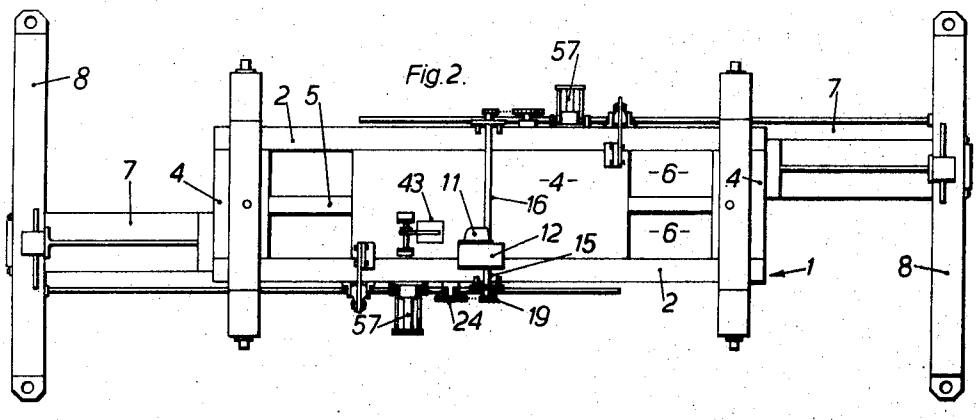
Primary Examiner—Evon C. Blunk
Assistant Examiner—W. Scott Carson
Attorney—Scrivener, Parker, Scrivener & Clarke

[57] **ABSTRACT**

A spreader frame for container handling equipment comprises a hollow box-like main frame and two parallel side-by-side booms which are movable in opposite directions. A chain is mounted lengthwise of each boom and meshes with a sprocket, both of which are driven from a common shaft to move both booms synchronously. A limit switch detector automatically controls the extension of the booms to a selected station and a wedge mechanism automatically locks the booms to the main frame at this station.

4 Claims, 9 Drawing Figures



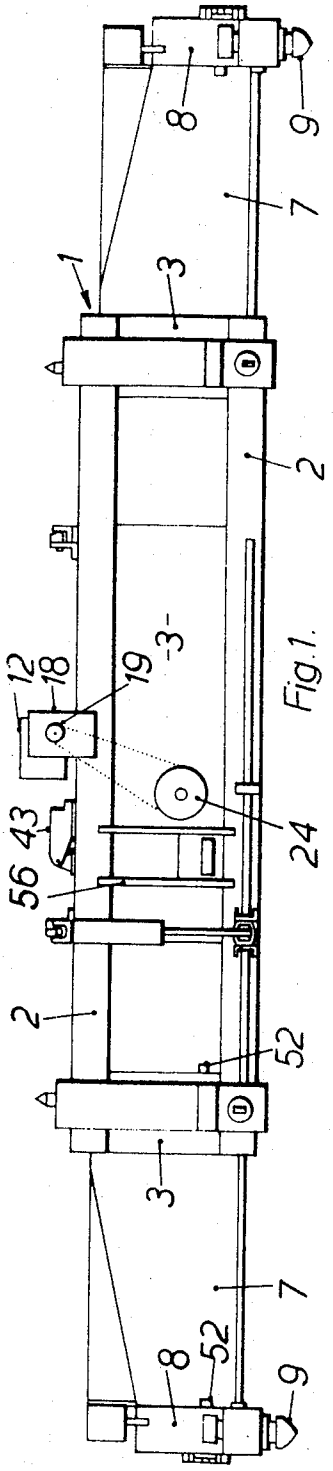

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Fig.1.

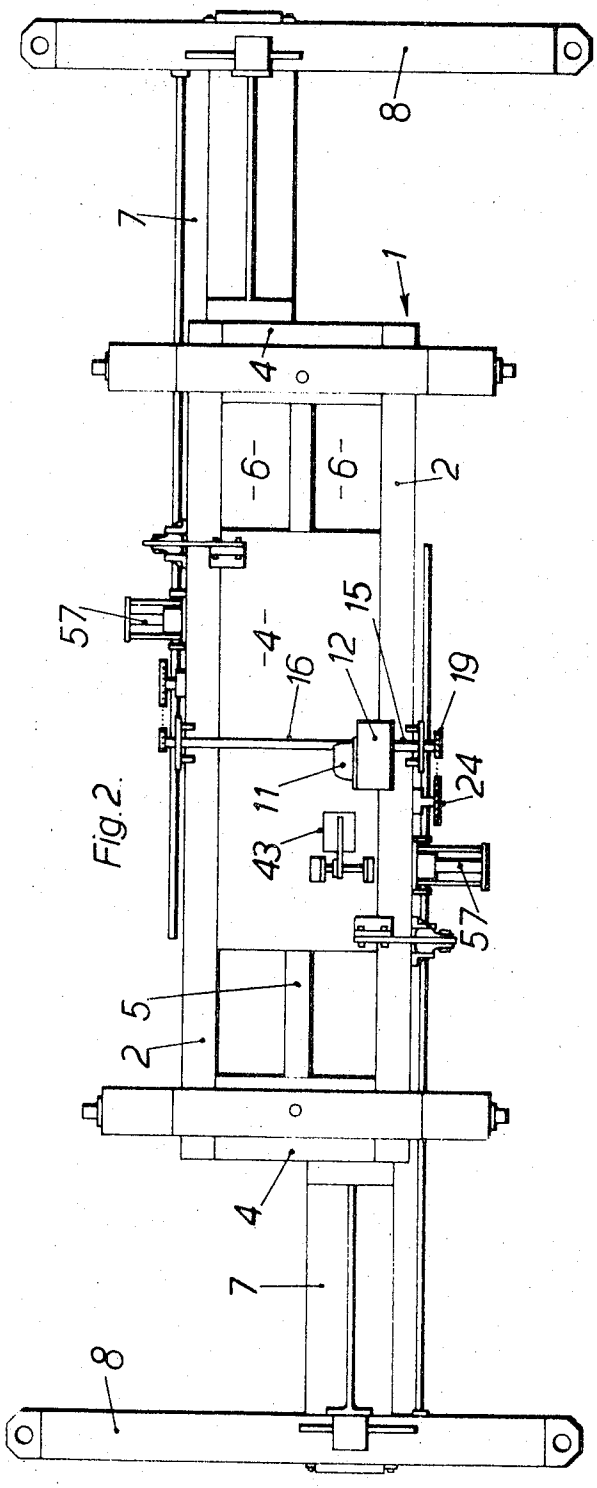
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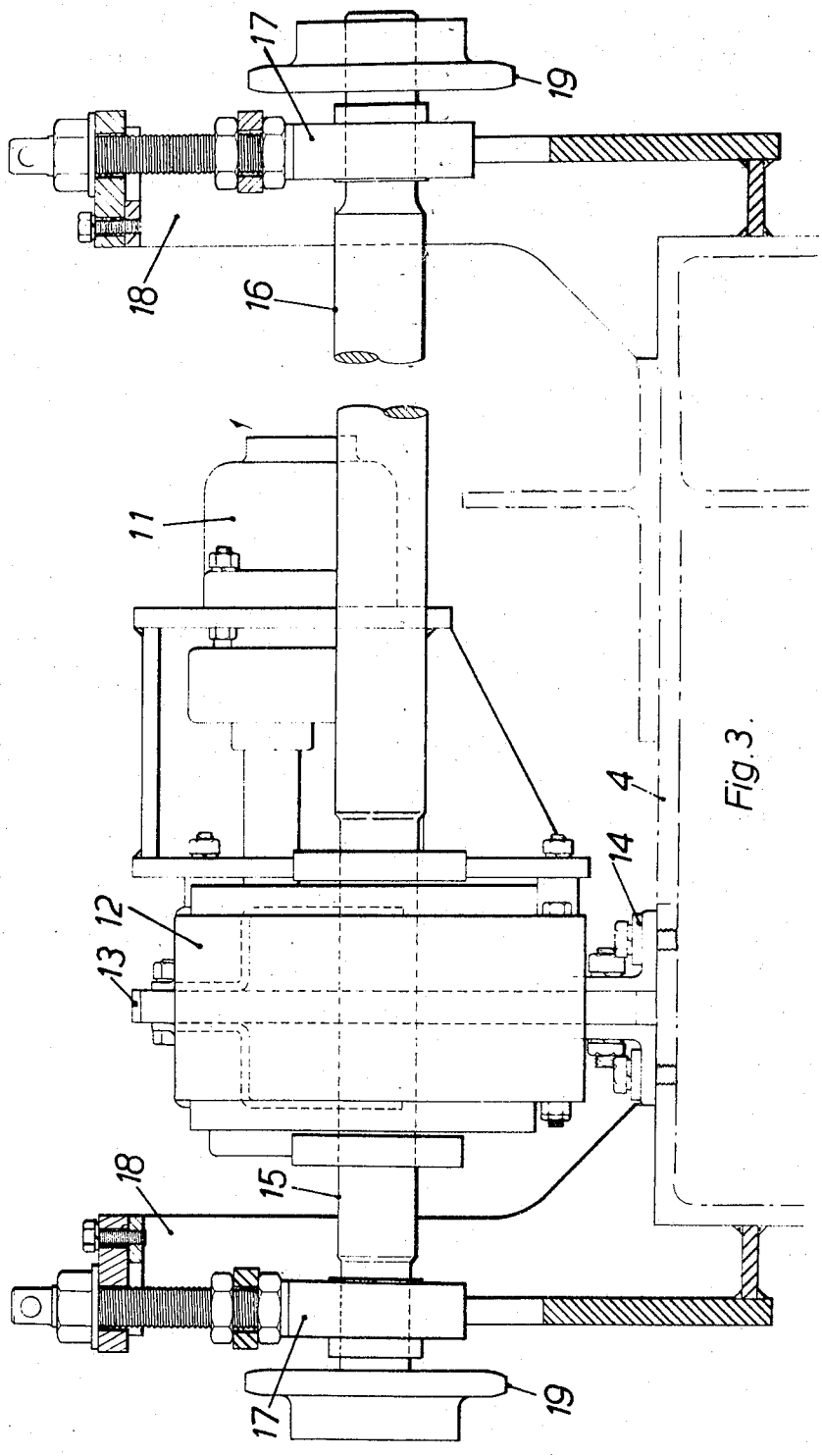
Fig.2.



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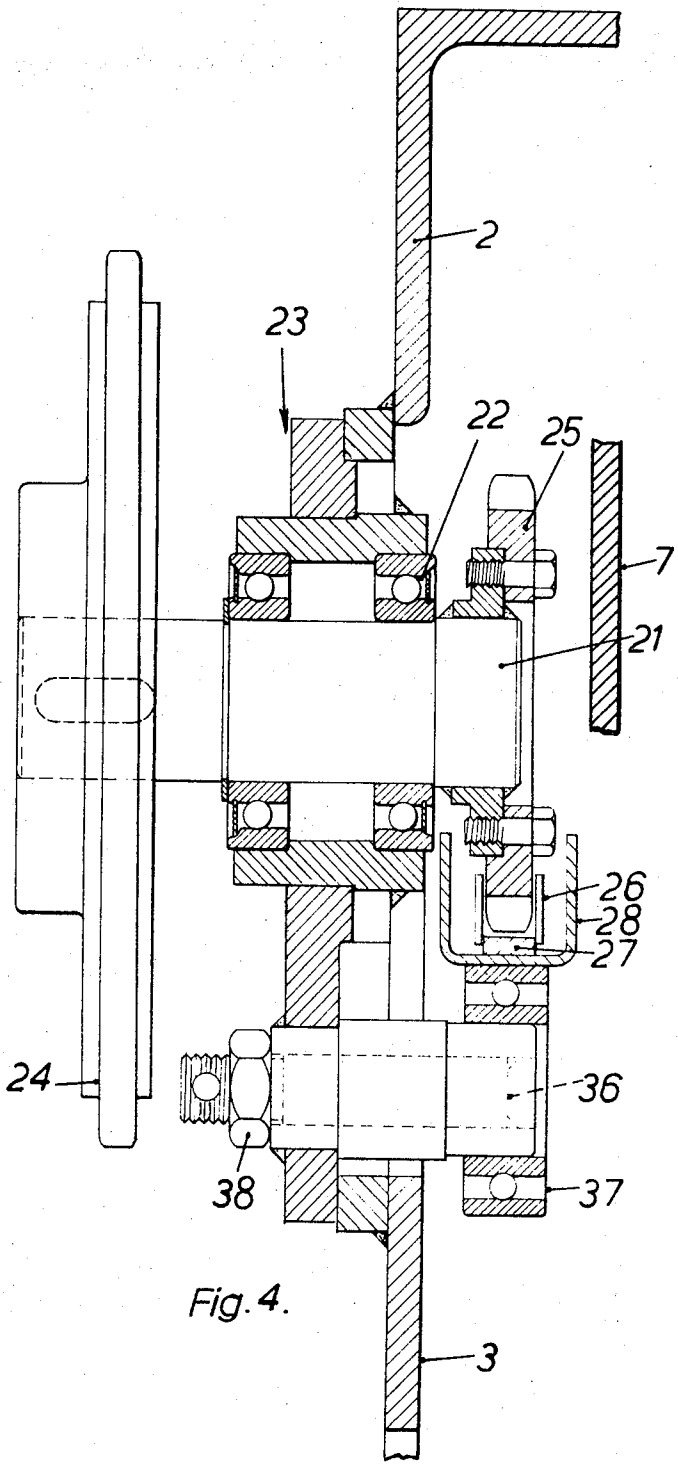
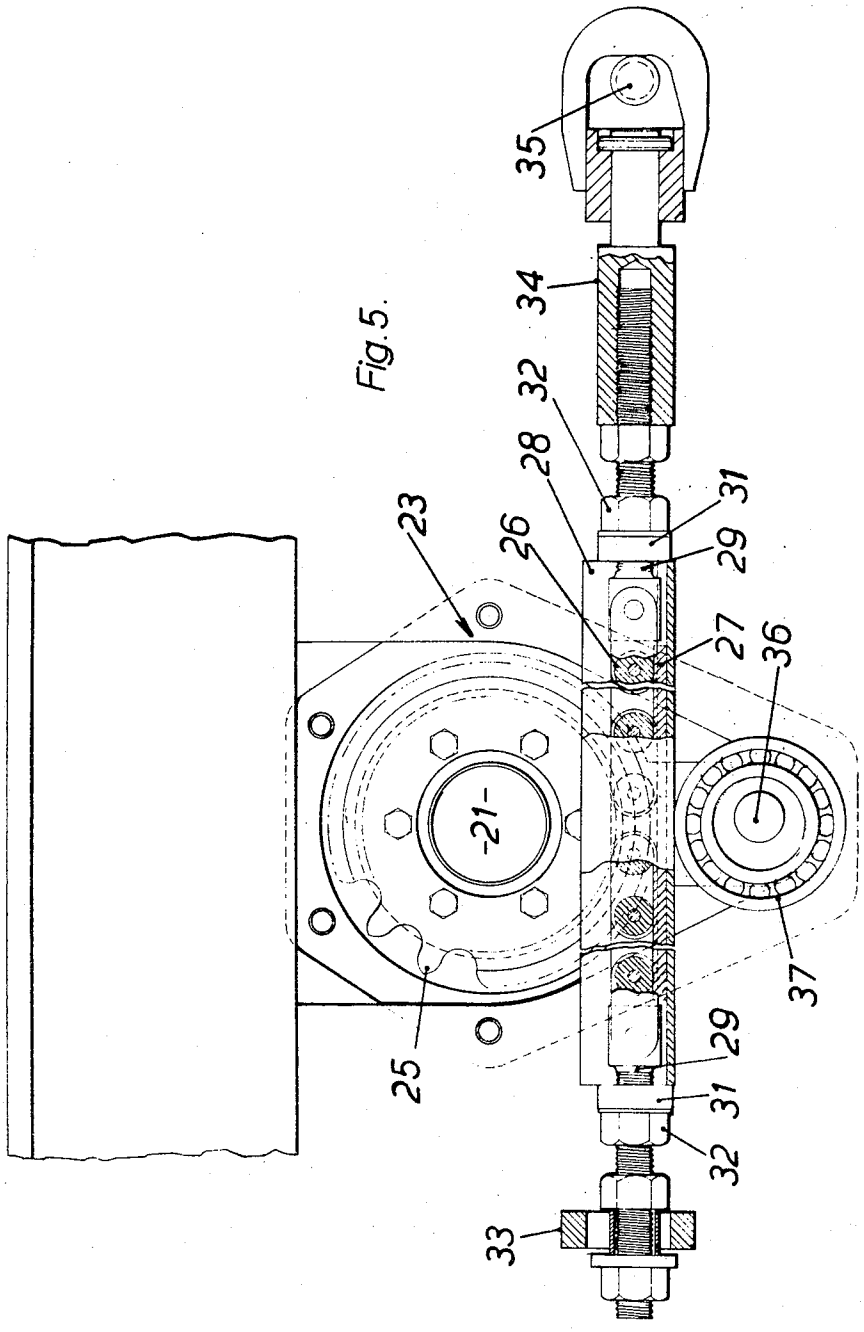
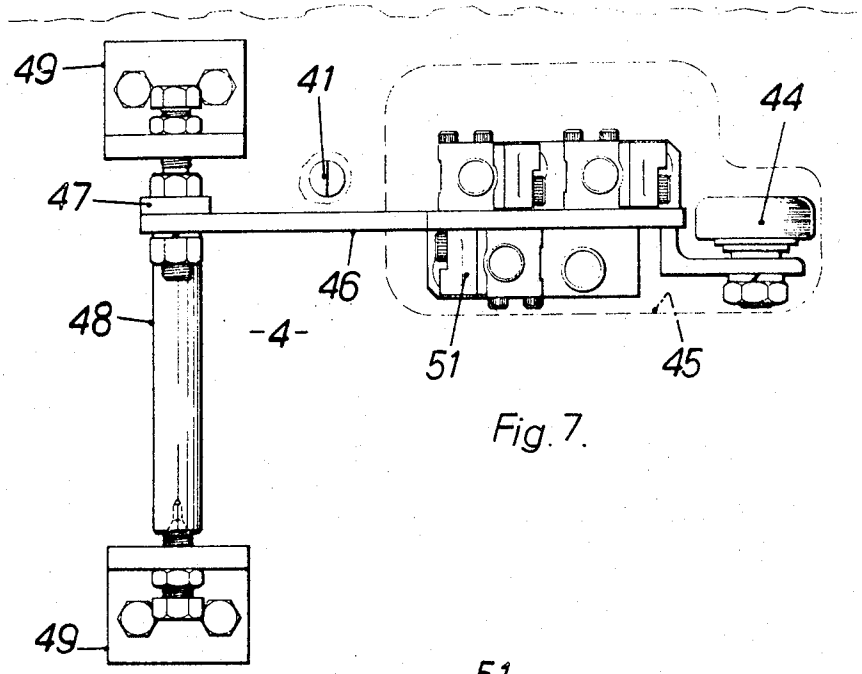


Fig. 4.

Fig.5.





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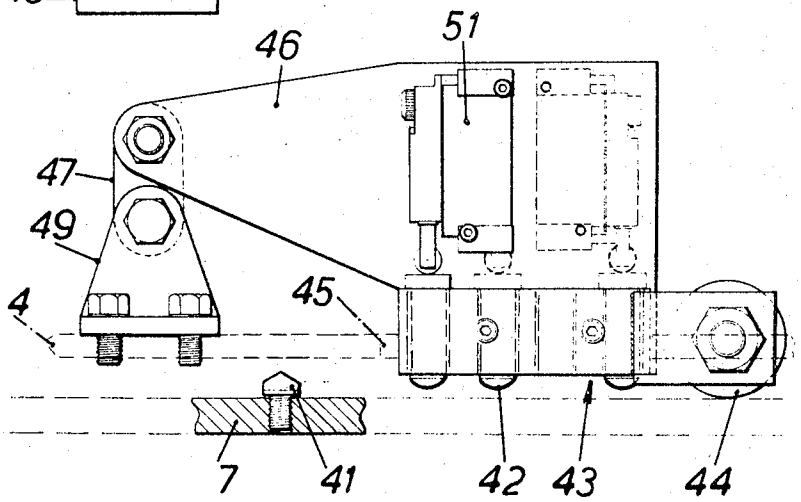

Fig. 6.

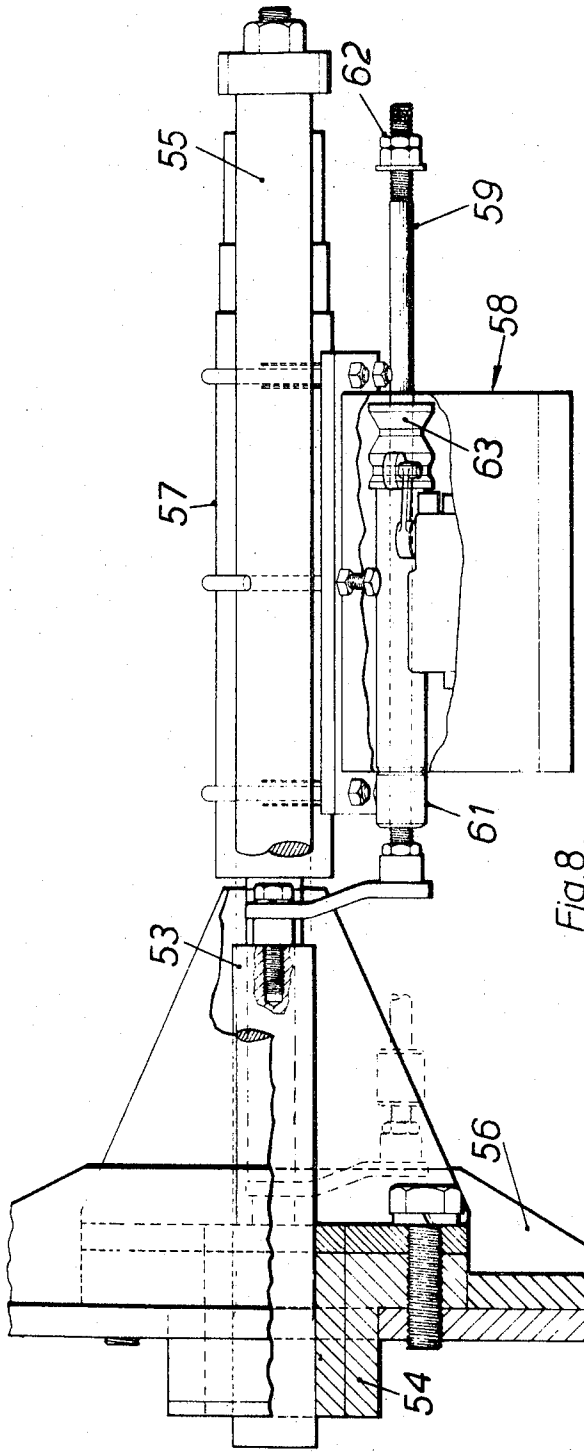

Fig.8.

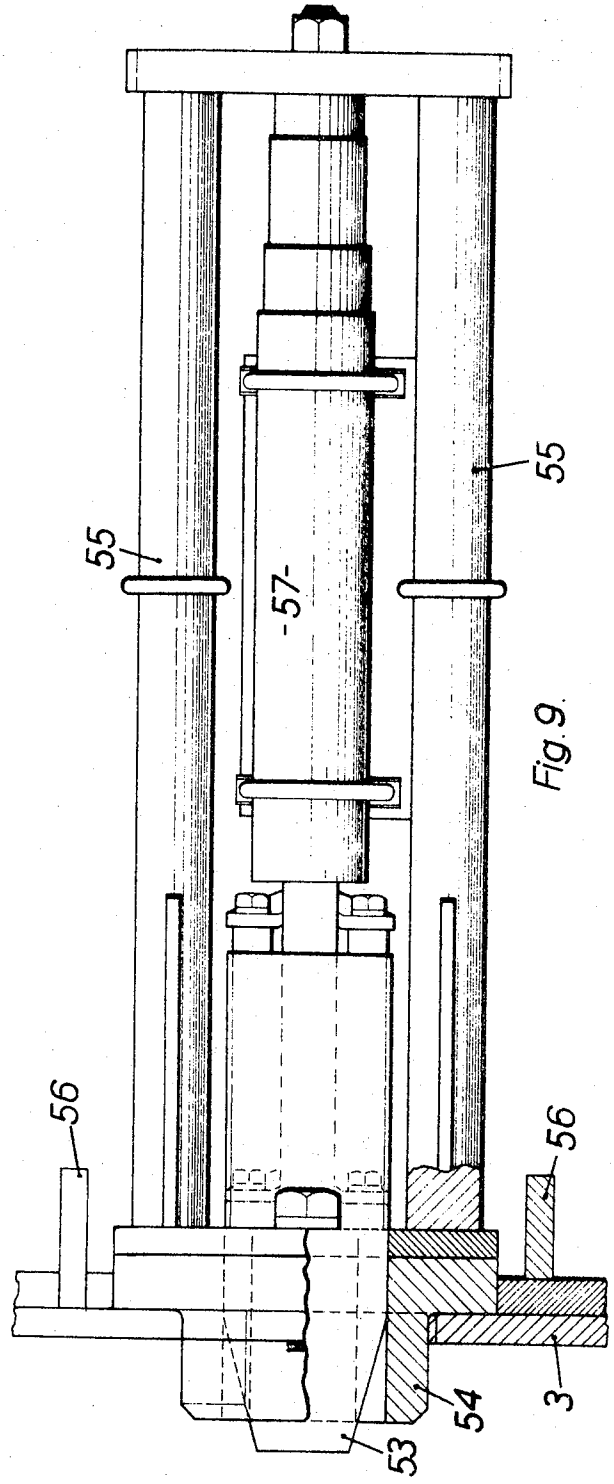

Fig. 9.

MEANS FOR HANDLING FREIGHT CONTAINERS AND THE LIKE

This invention relates to spreader frames for handling loads such as freight containers of considerable bulk and weight which, in the course of a journey, may have to be loaded on to and unloaded from different forms of transport.

A freight container is usually picked up by overhead lifting mechanism through an intermediary of a spreader frame adapted to engage with the corners of the container, and one of the difficulties is that containers are made of different lengths. Standard containers are 8 feet wide and 20, 30, or 40 feet long, but containers of intermediate lengths are also in use or proposed.

One of the objects of our invention is to provide a spreader frame which will handle loads such as containers of different lengths.

According to our invention a spreader frame for load handling equipment comprises a hollow box-like main frame in which parallel booms are slidably mounted and are movable in opposite directions by power-operated means, cross-heads carrying load-engaging locks being mounted on the outer ends of the booms.

Preferably the booms are arranged to move in synchronism.

The distance through which the booms are extended may be pre-selected, means being incorporated for cutting off the power-operating means when the booms reach a selected station and for locking them in that station.

Preferably the power operated means comprises a chain mounted in a carrier which is detachably and adjustably mounted lengthwise of each boom and means for causing each chain to mesh with a sprocket, both of which are driven from a common shaft.

One embodiment of this invention is described by way of example and is illustrated in the accompanying drawings, in which:

FIG. 1 is a diagrammatic side view of a spreader frame,

FIG. 2 is a plan view of the spreader frame in FIG. 1,

FIG. 3 is an end view of the power source for extending the booms,

FIG. 4 is a section through the mechanism for extending the booms,

FIG. 5 is a view of a chain mounted on a boom,

FIG. 6 is a side view of a micro-switch assembly mounted on the spreader frame,

FIG. 7 is a plan view of FIG. 6,

FIG. 8 is an end view of means for locking a boom in an extended position and

FIG. 9 is a plan view of FIG. 8.

As shown in FIGS. 1 and 2 the main section 1 of a spreader frame is fabricated from four substantial angle section lengths 2 of structural steel which constitute the corners of a generally box shape structure. Side plates 3 and top and bottom plates 4 unite the angle sections 2 at their extremities and reinforcement is provided by additional plates 3 and 4 secured to the angle sections 2 intermediate the ends thereof. Vertical plates 5 are secured between the top and bottom plates 4 on the centre line of the structure to divide it into two parallel side-by-side open-ended compartments 6. Bearing surfaces (not shown) are provided in each compartment 6 along which a boom 7 is slidable.

Each boom 7 is of tubular box section, strengthened with internal plates as necessary to provide torsional stiffness, and at its extremity remote from the main section 1 carries a cross-head 8 provided with transversely spaced twistlocks 9. One boom 7 extends beyond one end of the main section 1 and the second boom extends beyond the other end of the main section.

Means for extending and retracting both booms 7 synchronously are illustrated in FIGS. 3 to 5. FIG. 3 shows an hydraulic motor 11 coupled to the input shaft of a reduction gear-box 12 which is restrained from turning by a steady arm 13 carried by a bracket 14 on the intermediate top plate 4. The gear-box 12 has two output shafts 15 and 16 which extend in opposite directions, one to each side of the main section 1 where they are supported in bearings 17 which carry the load of the motor 11 and gear-box 12. The bearings 17 are vertically adjustable in brackets 18 welded to the main section 1.

Each shaft 15 and 16, outboard of its bearing 17, carries a chain sprocket 19. An intermediate drive shaft 21 (FIGS. 4 and 5) is arranged parallel to and below each output shaft 15 and 16 and is supported in bearings 22 carried by a flange assembly 23 on the intermediate side plate 3. Each intermediate drive shaft 21 carries an outer sprocket 24 and an inner sprocket 25 one on each side of the bearing 22, the outer sprocket 24 being co-planar with the corresponding main drive sprocket 19 and being connected to it by an endless chain (not shown).

One boom 7 has a drive chain 26 whose rollers rest on a thrust pad 27 in the base of an elongated channel section carrier 28. The pad 27 supports the chain 26 so that its longitudinal axis coincides with the neutral axis of the carrier 28. An anchor stud 29 is connected to each end of the chain 26 and passes through an end block 31 which is tightened against the end of the carrier 28 by a nut 32 screwed onto the stud 29. Tightening of the nuts 32 tensions the chain 26 and this tension is reacted by a compressive load in the carrier 28. The anchor stud 29 projecting from one end of the carrier 28 is bolted on to a slotted lug 33 on the boom 7 and the second stud 29 is connected to a turnbuckle 34 hooked over a peg 35 on the boom 7. This suspension of the chain and carrier assembly allows limited vertical and lateral movement so that the chain can be meshed with the bottom of the inner sprocket 25. Studs 29 and turnbuckle 34 provide adjustment of the assembly lengthwise of the boom 7 for synchronisation of movement of the two booms.

Beneath the intermediate drive shaft 21 a shaft 36 is eccentrically mounted in the flange assembly 23. The inner end of the shaft 36 carries a ball bearing 37, and the upper periphery of the outer race engages the underside of the carrier 28. The shaft 36 is rotated to bring the chain 26 into engagement with its drive sprocket 25 and is then locked in position by nut 38.

A similar construction is used on the other boom 7 except that the carrier 28 is inverted so that the chain 26 engages the top of its drive sprocket 25 and the eccentric shaft 36 and bearing race 37 are arranged above the carrier 28. With this arrangement rotation of the motor 11 in one direction will simultaneously extend the booms 7, whilst reverse rotation of the motor 11 will retract the booms simultaneously.

The chains 26 are preferably tensioned to a load equal to or somewhat in excess of the frictional load

which has to be overcome to move the respective booms 7 so as to substantially eliminate any backlash and maintain synchronism.

The upper surface of one of the booms 7 is provided with three cam surfaces 41 (only one shown in FIG. 6) spaced longitudinally so as to correspond to predetermined boom extension stations suitable for picking up 20ft, 30ft. and 40ft. standard containers respectively. The cam surfaces 41 are staggered transversely of the boom 7 whereby they may be engaged by and lift respective plungers 42 slidably mounted in a substantial housing 43. A roller 44 on one end of the housing 43 supports it on the upper surface of the boom 7 through an opening 45 in a top plate 4 of the main section 1. An arm 46 on the other end of the housing 43 is adjustably connected to a link 47 which in turn is pivotally mounted on a shaft 48 laterally adjustable between two brackets 49 on the top plate 4 to align the plungers 42 with the cams 41. This pivot/roller arrangement allows for any unevenness in the surface of the boom 7.

Above each plunger 42 a micro-switch 51 is mounted in the housing 43 so that when one cam 41 passes under its associated plunger 42 during movement of the boom 7 the corresponding micro-switch 51 is operated. The signal so generated can be used to cut off the supply of fluid to the hydraulic motor 11 so as to automatically stop extension or retraction of the booms at a preselected station. The preselection can be arranged by selecting the appropriate micro-switch 51 and connecting it in the control circuit for the motor 11.

The cut-off point for the hydraulic motor 11 can be adjusted so as to obtain correct boom extension by varying the included angle between the link 47 and the housing arm 46.

To increase the range of stations selectively available additional cams, plungers and microswitches can be fitted. Alternatively suitable change over switches can be provided to select a combination of stations out of a given number e.g., 20ft., 24ft., 35ft., or 24ft., 35ft., 40ft., and the combination need not be limited to three stations.

Referring now to FIGS. 1, 2, 8 and 9 longitudinally spaced apertures 52 are shown cut in the outer side of each boom 7 to receive a wedge 53 for locking the boom 7 to the main section at an extension corresponding to a preselected station. The wedge 53 is guided by a bush 54 set in the intermediate side plate 3. Outriggers 55 secured to brackets 56 extending between upper and lower angle sections 2 support one end of a double-acting hydraulic jack 57, the other end of which is connected to the wedge 53. The front and rear edges of the wedge 53 are tapered to provide a camming action for correcting any slight misalignment of the bush 54 and apertures 52 by causing movement of the boom 7 when the jack 57 is operated to insert the wedge.

A micro-switch 58 is suspended from the jack 57 and an outrigger 55, the control rod 59 of the micro-switch 58 being connected to the outer end of the wedge 53. Stops 61 and 62 at the ends of the control rod 59 operate a cam 63 which trips the micro-switch when the wedge 23 reaches its limit positions, the fully inserted position being indicated by chain dot in FIG. 5. The micro-switch 58 is included in an electrical circuit operating signalling means. It also can be in a circuit preventing operation of motor 11 unless the wedges 53 are withdrawn. Alternatively, hydraulic sequencing may be provided to ensure that the wedges 53 are withdrawn before the hydraulic motor 11 can be operated.

The hydraulic jacks 57 can be operated to insert the wedges 53 on a signal derived from the micro-switch 51 when the booms 7 have reached a selected station. It can be arranged for the boom 7 to stop just short of the desired station in the direction in which they are being driven and then the camming action of the wedges 53 drives them the rest of the way.

The construction of the main section 1 already described may be unnecessarily heavy and a lighter structure may be preferable. In an alternative form of boom drive mechanism (not illustrated) a chain connected to the boom 7 may be reeved around the inner sprocket 25 and a fourth chain sprocket rotatably mounted on the side of the boom to be co-planar with the inner sprocket 25.

We claim:

1. In load handling equipment for freight containers of different lengths a spreader frame comprising an hollow box-like main frame, two parallel booms mounted in the main frame for sliding movement in opposite directions, a cross-head on the outer end of each boom, a load-engaging lock adjacent each of the outer ends of each cross-head, the four locks being adapted to engage the four corners of a freight container, a chain carrier mounted on each boom and extending lengthwise of the boom, a longitudinally extending chain supported by each carrier, means for tensioning the chain with respect to the carrier, a power-driven sprocket rotatably mounted on the main frame for engagement with each chain, two shafts eccentrically mounted for rotation in the main frame, and a roller carried by each shaft and bearing against one of the chain carriers whereby rotary adjustment of one of the shafts causes its associated chain to mesh with the sprocket which is adapted to drive the boom relative to the main frame.

2. In equipment as in claim 1 the spreader frame including a series of longitudinally spaced apertures in one of the booms, and a power-operated wedge guided on the main frame for transverse movement and capable of co-operating with one of the apertures whereby the boom can be locked to the main frame at a selected station.

3. In equipment as in claim 2 means being provided to signal whether the wedge is in the locking position.

4. In equipment as in claim 1, a rotary motor mounted on the top of the main frame and coupled mechanically to said two sprockets for moving the booms synchronously In opposite directions, said chains being mounted on the outer side of each boom between the boom and the main frame.

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