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3,352,441

CRANE BOOM

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3 Sheets-Sheet 1

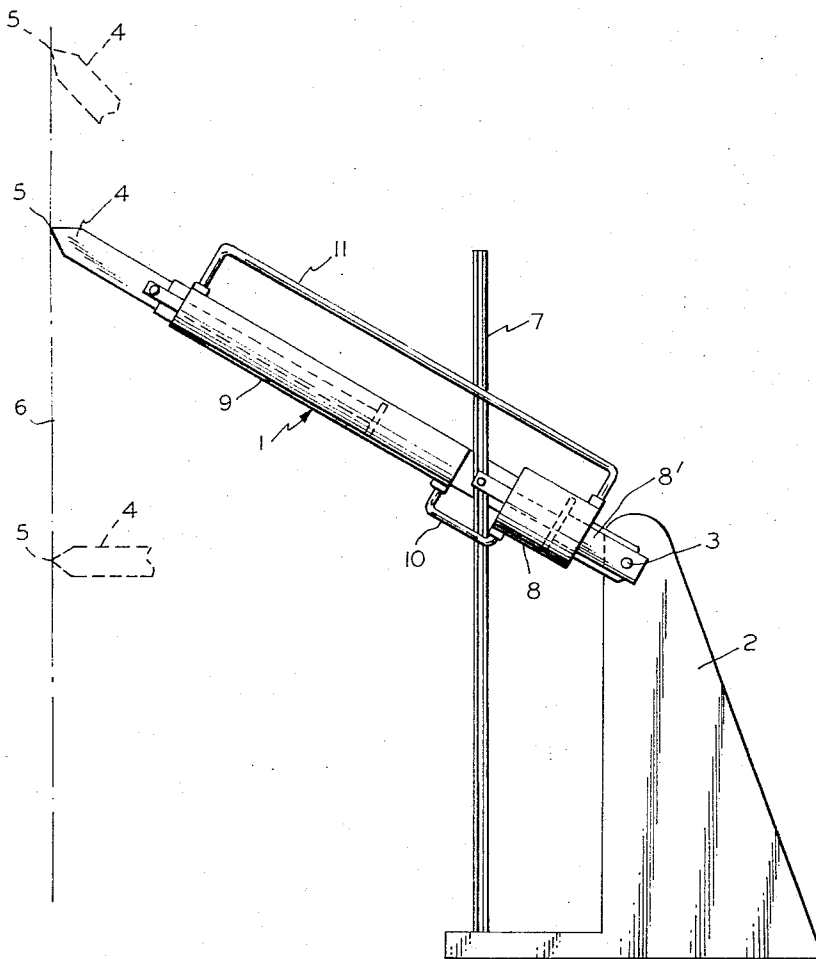


FIG. 1

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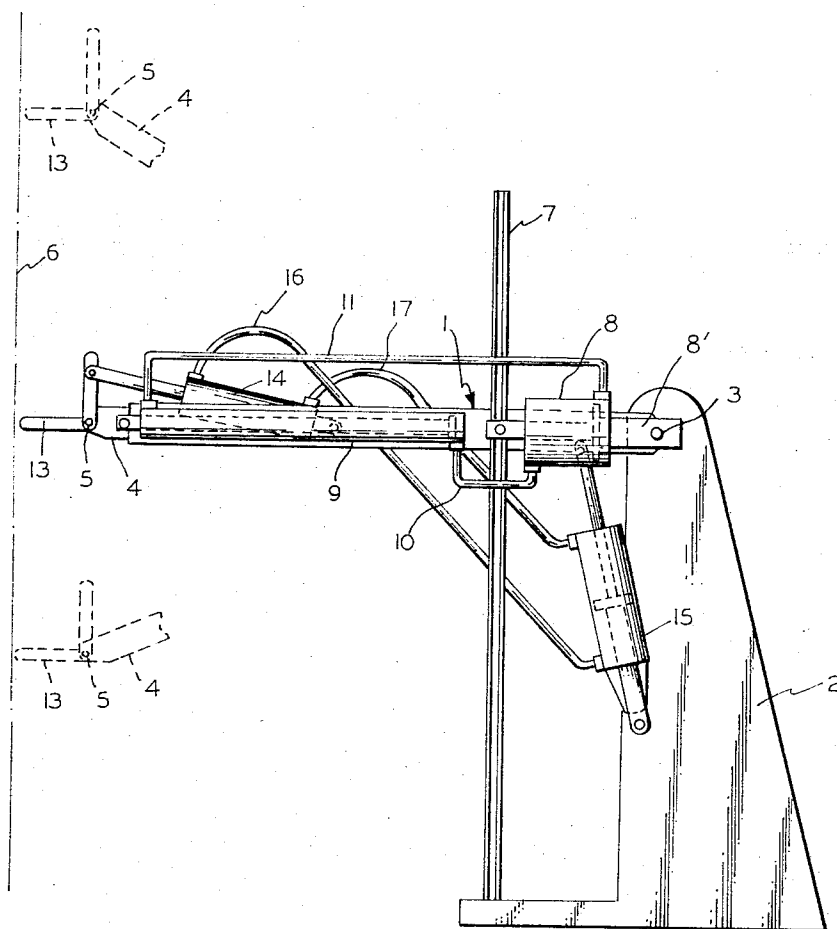


FIG. 2

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CRANE BOOM

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7 Claims. (Cl. 214-130)

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This invention relates to a crane boom with an end portion that faces away from the fulcrum of the boom and is so arranged as to permit extension thereof in relation to the remaining boom. The principal characteristic of the invention is that the free end of the crane boom is adapted at the pivotment of the boom to move in a path uniform with another path constituted by a guide adjacent the fulcrum of the boom, by the actuation of two double-acting hydraulic operating cylinders the working chambers of which communicate in pairs through direct conduits, one operating cylinder being interposed between the crane boom and the guide while the other operating cylinder is interposed between the crane boom and the extensible end portion thereof, the effective cross sectional area of the operating cylinder coacting with the guide being so much larger than that of the operating cylinder coacting with the end portion as the distance of the free end of the crane boom from the fulcrum is greater than the distance of the guide from the fulcrum. Thus, the free end of the crane boom will automatically move at the pivotment of the crane boom in a path predetermined by the guide, which involves great advantages in many different respects.

These and further features of the invention will become apparent from the following description in which reference is made to the accompanying drawings diagrammatically illustrating an embodiment, chosen by way of example, of the crane boom according to the invention.

In the drawings:

FIG. 1 is a side elevational view of the crane boom without any load supporting member;

FIG. 2 is a side elevation of the crane boom with a load receiving member thereon;

FIG. 3 is a plan view of an additional assembly in a modified embodiment of the crane boom.

1 denotes the crane boom proper which is pivoted to a frame 2 about a horizontal axis 3. At the end remote from the fulcrum 3 the boom 1 is provided with an end portion 4 which is adapted for extensible movement longitudinally of the boom and the free end 5 of which is the free end of the crane boom 1.

According to the invention, the free end 5 of the crane boom 1 is adapted at the pivotment of the boom automatically to move in a path 6 indicated by broken lines in FIG. 1 and uniform with another path constituted by a guide 7 adjacent the fulcrum 3 of the boom 1. This movement is realized by means of two double-acting hydraulic operating cylinders 8 and 9 the working chambers of which communicate in pairs through direct conduits 10 and 11. The operating cylinder 8 is interposed between the boom 1 and the guide 7 while the operating cylinder 9 is interposed between the crane boom 1 and the extensible end portion 4 thereof. To obtain the desired transmission ratio between the pistons in the operating cylinders 8 and 9 which are rigidly connected with the crane boom 1, the effective cross sectional area of the operating cylinder 8 is so much greater than that of the operating cylinder 9 as the distance of the free end 5 of the crane boom 1 from the fulcrum 3 is greater than the distance of the guide 7 from the fulcrum 3.

In the preferred embodiment illustrated, the operating cylinder 8 is arranged on one side and inside the guide 7

while the operating cylinder 9 is arranged on the other side and outside said guide 7. For an efficient utilization of the operating cylinders 8 and 9 their lengths are inversely proportional to the effective cross sectional areas thereof so that the volumes are equal.

The piston rod of cylinder 8 can have its ends provided with a pair of small wheels mounted on facing journals, and said wheels should engage in guide grooves provided in a rod 7 or like member. For this purpose the rod 7 may be of H-shaped cross-section.

The boom 1 is not telescopic but merely the end portion 4 is movable relative to the boom 1 longitudinally thereof. The cylinder 9 is fixedly connected with the boom 1 so that the end portion 4 will altogether follow the movements of the piston rod of said cylinder 9.

The cylinder 9 may be incorporated in the boom 1 as a fixed portion thereof. It can also have its rear end connected to the boom 1 at a pin transverse to the boom, which will be the normal mounting method. Also the cylinder 8 can be either a part fixedly connected to the boom 1 or have its rear end pivoted to the boom 1 in which case the mounting naturally is such as not to prevent in any way the movements of the extension 8'.

The end portion 4 is movably mounted at one side of the boom 1 so that one side of the end portion is always accessible independently of the position to which the end portion has been moved. It is on said side that the cylinder 14 is hinged to the pivot indicated in the drawing.

It should also be mentioned that the cylinder 8 is disposed on one side of the boom 1, for which reason the extension 8' is outside the fulcrum 3. Thus, the extension 8' can pass the fulcrum 3 unimpededly.

By providing the rod 7 on horizontal guides both at the upper and lower ends thereof there is formed a guide which is in the form of a plane.

In the embodiment shown in FIG. 1 the guide 7 is straight, but it could very well be curved.

When the crane boom 1 for example is raised from the position shown by full lines in FIG. 1 so that the distance from the fulcrum 3 to the point of engagement with the guide 7 increases, the piston in the operating cylinder 8 will reduce the volume of the working chamber closest to the guide 7, while the volume of the working chamber on the opposite side of the piston will increase. The fluid contained in the first-mentioned working chamber is thereby urged through the conduit 10 into that working chamber of the operating cylinder 9 which is closest to the guide 7. The piston of the operating cylinder 9 is urged towards the extensible end portion 4 which as a consequence will be pushed in an outward direction. The volume of that working chamber in the operating cylinder 9 which is closest to the extensible end portion 4 will thus decrease and the fluid contained in said working chamber will be urged through the conduit 11 to that working chamber in the operating cylinder 8 which is closest to the fulcrum 3.

By dimensioning and placing the operating cylinders 8 and 9 in the manner outlined hereinbefore the free end 5 will always be situated on the line 6 parallel to the guide 7, as has been indicated by broken lines. To realize this the piston in the operating cylinder 8 is equipped with an extension 8' which is similar to a piston rod and compensates for the volume of the piston rod in the operating cylinder 9. In another embodiment the pistons in the two operating cylinders 8 and 9 may be equipped with extensions similar to piston rods and having the same cross sectional area as the piston rods proper.

The guide 7 need not necessarily be linear but may be a plane, provided that the crane boom also is pivoted about a vertical axis 12 intersecting the fulcrum 3. According to FIG. 3, said guide is planar but it may also be

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curved, preferably having a single curvature in the manner of a cylindrical circumferential surface.

In FIG. 2 the loading gear illustrated in FIG. 1 has been provided with a load supporting member 13, for instance a platform, adapted to be moved vertically along a house wall or the like. The member 13 is pivoted at 5 to the extensible end portion of the crane boom.

A hydraulic operating cylinder 14 is hinged between the load supporting member 13 and the end portion 4 while another hydraulic operating cylinder 15 is hinged between the crane boom 1 and the frame 2. The hinge points of the operating cylinder 14 at the load supporting member 13 and the end portion 4 are so placed as to form together with the pivot point 5 of the load supporting member the corners of a triangle similar to or congruent with the triangle the corners of which are formed by the hinge points of the operating cylinder 15 at the crane boom 1 and the frame 2 as well as the fulcrum 3 of the crane boom 1 at the frame 2.

The operating cylinders 14 and 15 are double-acting and designed with working chambers so communicating in pairs through direct conduits 16 and 17 as to ensure that the load supporting member 13 always occupies the same angular position in relation to the ground irrespective of the pivoting of the crane boom 1 in the vertical plane. A horizontal platform can thus always be kept horizontal in the manner described.

FIG. 3 shows an additional assembly for the crane boom according to FIGS. 1 and 2 when the guide 7 is not linear but a plane. The said assembly which comprises a pair of double-acting hydraulic operating cylinders 18 and 19 with working chambers communicating in pairs through direct conduits 20 and 21, ensures that the load supporting member 13 always retains its orientation in space. For the operating cylinder units 18, 19 are of the same nature as the operating cylinder units 14, 15. The crane boom 1 according to the invention thus permits moving a horizontal platform in parallel with a house wall, which in turn is plane parallel with the guide plane 7.

While the invention has been described in the aforementioned embodiments with reference to the accompanying drawings it is readily understood by those skilled in the art that it permits of modification within the scope of the appended claims.

What I claim and desire to secure by Letters Patent is:

1. A crane boom comprising a fulcrum, a guide located adjacent said fulcrum of said boom, a free end portion

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extending away from the fulcrum of said boom and extensible in relation to the remaining portion of said boom, said free end portion being adapted at the pivoting of said boom to move in a path uniform with another path formed by said guide, two double-acting hydraulic operating cylinders having working chambers communicating in pairs through direct conduits, one operating cylinder being interposed between said boom and said guide while the other operating cylinder is interposed between said boom and said extensible free end portion, the effective cross sectional area of the operating cylinder coacting with said guide being so much larger than that of the operating cylinder coacting with said free end portion as the distance of said free end portion from said fulcrum is greater than the distance of said guide from said fulcrum.

2. A crane boom in accordance with claim 1, wherein said guide is linear.

3. A crane boom in accordance with claim 2, wherein said guide is straight.

4. A crane boom according to claim 1, wherein said guide is a plane.

5. A crane boom according to claim 1, wherein said operating cylinder interposed between said boom and said guide is arranged inside and on one side of said guide while said operating cylinder interposed between said boom and said free end portion is arranged on the other side and outside said guide.

6. A crane boom in accordance with claim 1, wherein the lengths of said operating cylinders are inversely proportional to their effective cross sectional areas.

7. A crane boom in accordance with claim 1, wherein said boom is provided at said free end portion with a platform load supporting member pivoted to said boom and having two double-acting hydraulic operating cylinders with working chambers communicating in pairs through direct conduits cooperating with said member to retain its orientation in space irrespective of the pivoting of said boom.

References Cited

UNITED STATES PATENTS

2,731,162	1/1956	Walstrom	214—140
2,786,723	3/1957	Harsch	214
2,860,793	11/1958	Lapsley	214—140
2,990,072	6/1961	Mindrum	214—140
3,187,911	6/1965	Christenson	214—140

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