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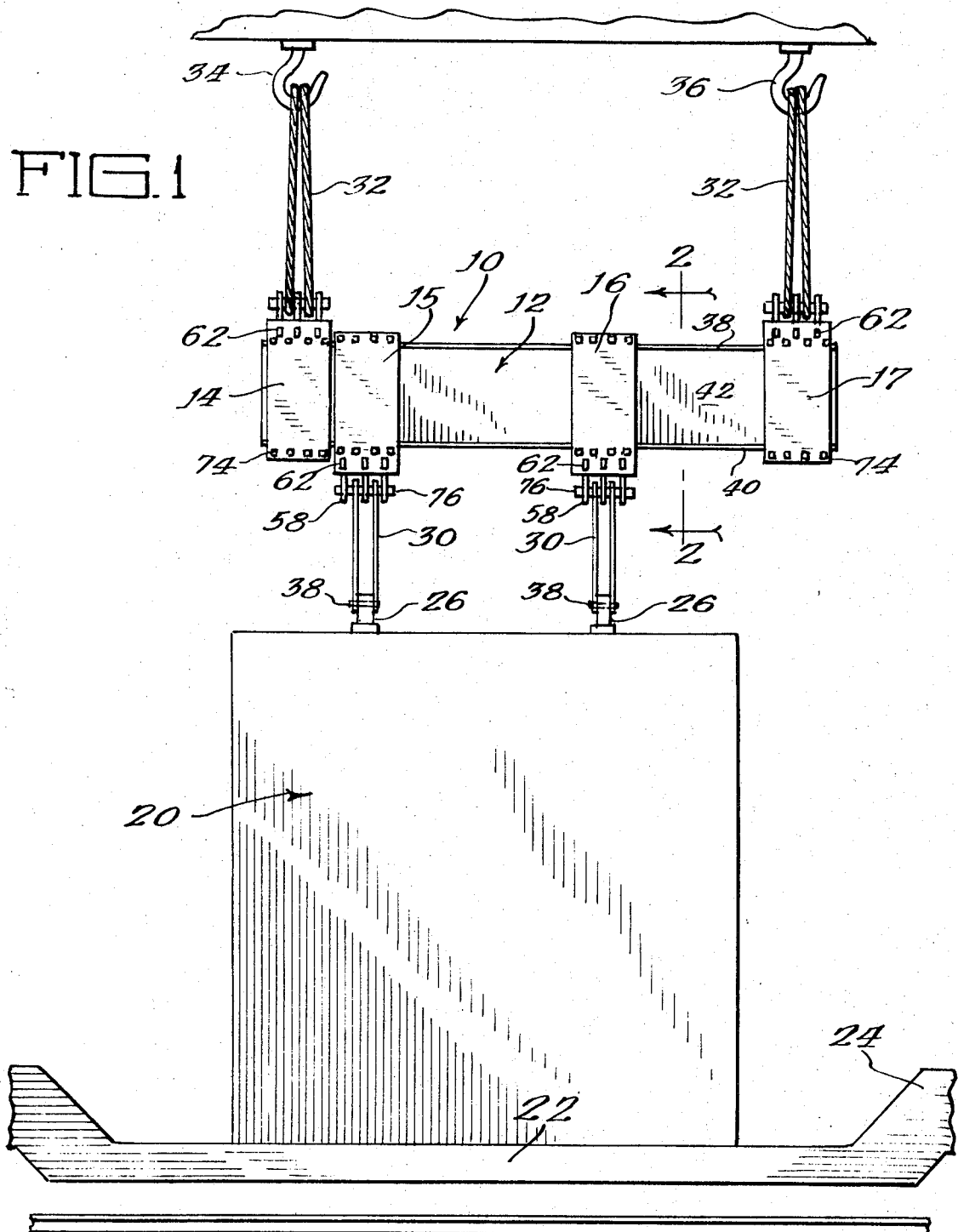
3,561,810

LIFTING BEAM ASSEMBLY

Filed Sept. 23, 1968

2 Sheets-Sheet 1

FIG. 1



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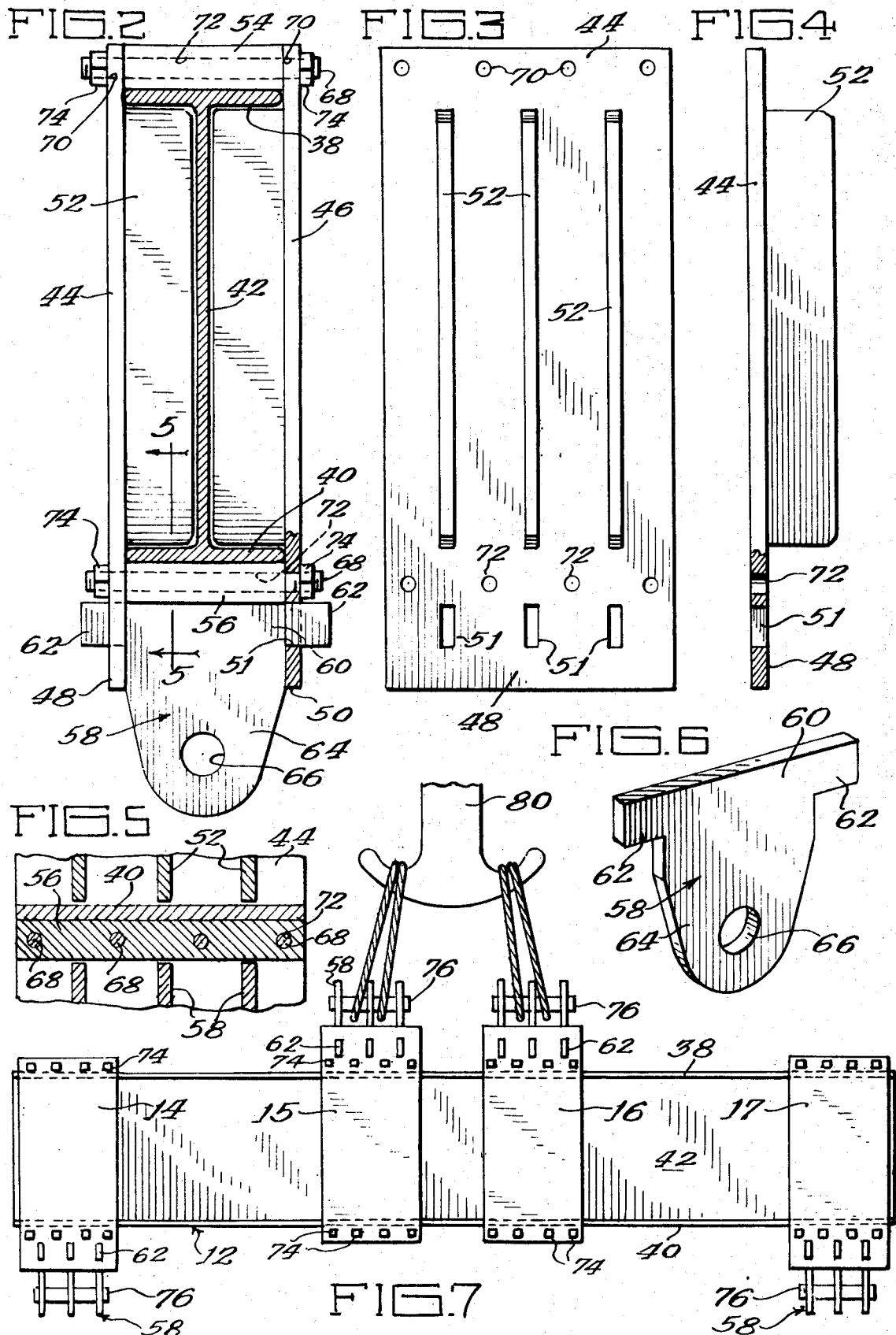
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LIFTING BEAM ASSEMBLY

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6 Claims

ABSTRACT OF THE DISCLOSURE

A lifting beam for cranes for use in the material handling area is designed in such a way that each one of a plurality of hanger brackets on the beam is movable along the length of the beam to an infinite number of positions so as to make it possible to locate the hangers on the beam to balance the forces acting on the beam as a load is lifted. The beam generally is a wide flange beam and the hanger brackets are constructed in such a way as to provide rigidity to the beam without the use of stiffeners on the beam. The hanger brackets are reversible with the load attaching portion facing up or down as required. The hanger brackets can be located along the beam at precomputed locations depending upon the size of the load and the availability of one or two cranes for doing the lifting.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to the material handling area and more particularly to a stabilized lifting beam with plural hanger brackets selectively positioned along the length of the beam for balanced lifting of a load.

DESCRIPTION OF THE PRIOR ART

For some time it has been accepted practice in lifting large loads of several hundred tons to make up a lifting beam by welding ribs between the top and bottom flange and against the center web for stability of the beam, and by welding hangers at preselected locations along the beam such that one or two cranes can hook onto one or two of the hangers on the beam for lifting the load attached to two of the other hangers on the beam. After the load has been moved, the beam and hangers are discarded as scrap.

Another prior art device is shown in the U.S. Pat. No. 1,671,252 in the name of G. E. Moore and issued on May 29, 1928 wherein a crane is shown connected to a specially designed beam which has hangers for attachment to the load to be lifted. The connections of the pulleys from the crane to beam are movable to any one of three predetermined positions in the beam and the hangers are movable to any one of three positions on one end or four positions on the other end of the beam for adjusting the balance of the beam for a limited number of load conditions.

SUMMARY OF THE INVENTION

The present invention is directed to the infinite adjustability of the positions of plural hanger brackets along the length of a beam so as to balance forces acting on the beam for lifting substantially large loads. The hanger brackets are constructed and arranged so as to provide stiffening members for the beam, so as to be reversible for upwardly or downwardly directed forces, and so as to be simply assembled and for easy repair or replacement of broken or worn parts.

In the drawings:

FIG. 1 is a fragmentary elevation view of one form of my invention as connected to two hooks and to a large container to be lifted;

FIG. 2 is an enlarged cross-sectional view taken on the line 2—2 of FIG. 1;

FIG. 3 is an enlarged side view of a side plate of the hanger bracket of FIG. 2;

FIG. 4 is an end view of plate of FIG. 3 showing the flange and web stiffening plate;

FIG. 5 is a broken away cross-sectional view taken along the line 5—5 of FIG. 2;

FIG. 6 is a perspective view of one of the pin holding plates of the hanger bracket; and

FIG. 7 is a modified form of my invention with the hanger brackets set for use with a single crane.

Referring to the drawings wherein similar reference numerals refer to similar parts throughout the several views, a heavy-duty lifting beam assembly 10 is illustrated as comprising a wide flange beam 12 having a plurality of hanger brackets 14, 15, 16 and 17 adjustably positioned therealong. In FIG. 1, a heavy container 20 is shown resting on the bed 22 of a flat car 24 (partially shown). The container 20 is provided, in this showing, with a pair of lifting lugs 26 welded or bolted to the frame of the container. The hanger brackets 15 and 16 are shown connected to the lugs 26 by means of pins 28 passing through links 30 carried by said hanger brackets 15 and 16. Hanger brackets 14 and 17 are connected by means of cables 32 to hooks 34, 36, respectively, on cranes (not shown). In the illustrated embodiment of FIG. 1, the crane connected to hook 36 and bracket 17 has a lifting capacity which is somewhat less than the lifting capacity of the crane on hook 34 and bracket 14. Therefore, the brackets 15 and 16 connected to the load 20 are positioned closer to bracket 14 by an amount sufficient to balance the load and lifting capacities of the cranes as will appear as the invention is described in detail hereinafter.

The beam 12 is generally identified as a wide flange beam and has a top flange 38, a bottom flange 40 and a web 42 bridging between the top and bottom flanges midway between the side edges of the top flange and bottom flange and lying in a plane parallel to said side edges. The length and other dimensions of the beam such as its strength capacities are determined by the size and extent of the loads to be lifted with the particular lifting assembly.

The hanger brackets 14, 15, 16 or 17 are substantially identical in structure and are reversible for use either as a load attaching member (brackets 15, 16 of FIG. 1) or as a crane attaching member (brackets 14, 17 of FIG. 1). Only one hanger bracket (i.e., bracket 15) will be described in detail it being understood that the same description will apply to the other brackets.

Hanger bracket 15 is comprised of a pair of side plates 44, 46 (FIGS. 3 and 4) which are illustrated as generally rectangular in shape and when assembled as part of the bracket each plate will bridge between the side edges of said top and bottom flange with an extra portion 48, 50 (respectively) of the side plates overhanging on one end somewhat beyond the adjacent flange. Three spaced apart holes 51 are formed through portions 48, 50. Welded or otherwise rigidly secured to the inside face of each side plate is a plurality of stabilizing members 52. The members 52 are shaped to generally conform with the configuration of the beam between one-half of the flanges on one side of the beam and the web. As illustrated in FIGS. 2, 3 and 4, three such stabilizing members 52 are welded to the plates 44, 46 and are adapted to nest in the open spaces in each side of the beam 12.

The bracket 15 has a pair of flange plates 54, 56 which are fairly thick blocks of metal adapted to be secured between the side plates 44, 46 and above the top flange 38 and below the bottom flange 40 in juxtaposed relation therewith.

Each bracket has three holding plates 58 bridging between the side plates 44, 46 and juxtaposed outwardly of the flange plate 56. The holding plate 58 has an anchor portion 60 which has a pair of sideward projecting ears 62 which are adapted to nest in and project through the openings 51 in the side plates 44, 46. A retaining portion 64 projects from the anchor portion 60 and has an aperture 66 centrally disposed therethrough. With the three holding plates 58 positioned with the ears 62 of the anchor portion 60 in the aligned openings 51 in the plates 44, 46, the retaining portions 64 will project beyond the ends of said plates 44, 46 with the apertures 66 in each plate aligned with each other.

A plurality of bolts 68 pass through aligned openings 70 in the side plates 44, 46 and through openings 72 in the flange plates 54, 56 and have nuts 74 drawn up tight to hold the hanger brackets 15 together in assembled relationship. The lengths of the flange plates 54, 56 can be such that when the bolts and nuts are drawn up tight the side plates grip the edges of the flanges 38, 40 for holding the brackets locked in position along the length of the beam 12.

A pin 76 is positioned in the aligned openings 66 in the holding plates 58 and will be held with respect to said holding plates 58 by a snug fit with the walls of openings 66 or by means of abutments of appropriate type on the respective end portions of said pin. The links 30 of the hanger brackets 15 and 16 are engaged by the pins 76 with each link positioned between adjoining pairs of holding plates 58. In the case of the hanger brackets 14 and 17, the cables 32 wrap around the pins 76 between the holding plates 58. The pins 76 are adapted to transmit the loads to the holding plates 58 and hanger brackets 14, 15, 16 and 17 and must be designed to withstand the severe shearing forces acting thereon.

In the example of FIG. 1, the beam 12 is shown being used to lift a heavy bulky load 20 by the use of two cranes which cranes have different lifting capacities. The crane attached to hook 34 and hanger bracket 14 is capable of lifting several kips more than the crane attached to hook 36. Accordingly, the length of the beam 12 being known, and the lifting capacities of the cranes on hooks 34, 36 make it possible to compute the distance the centerlines of the hanger brackets 15, 16 are to be spaced with respect to the centerlines of the hanger brackets 14 and 17 (assuming that the mass weight of load 20 is substantially evenly distributed throughout the container for the load 20).

The hanger brackets 14, 15, 16 and 17 have the inwardly projecting stabilizing members 52 axially spaced apart along the beam. The members 52 on each hanger bracket are both axially spaced apart and are on opposite sides of the web 42 of the beam for creating a stabilizing network which reduces to a minimum the twisting and deflection of the beam 12. That is, wide flange beams generally are quite stable and suitable for lifting or supporting loads acting at spaced apart points on the beam. When heavy concentrated loads are applied to the beam, the limiting factor of the strength of the beam may be the tendency of the web 42 to buckle. Heretofore, webs or braces were welded between the flanges and the center web of the beam at spaced points along the beam to provide support against twisting and deflection forces. By means of the stabilizing members 52, the web receives support against buckling as was obtained by the prior welded braces or webs. The members 52 substantially conform along the exposed edge of the member to the configuration of the beam between the top and bottom flanges and the one side of the center web 42 such that any distortion or twisting of the web will bind against the plural spaced apart members 52 which will prevent any further distortion or twisting beyond the minimum amount affected to bring the flanges and web in contact with the edges of the members 52.

The modified form of the invention shown in FIG. 7 is really not a different form but rather is a different loading arrangement. That is, the hanger brackets 14 and 17 have been reversed and have the pins 76 in position to be connected to a load. The hanger brackets 15, 16 are likewise reversed with the pins 76 in position to be connected to a single lifting element, such as the double hook 80.

The locations of the hanger brackets 14, 15, 16, 17 of FIG. 7 is such as to indicate that a load connected to brackets 14 and 17 will have substantially equal weight on each bracket 14 and 17 and the lifting force of the hook 80 will be evenly distributed to the brackets 15, 16 at substantially the mid-point of the distance between bracket 14 and 17. It should now appear obvious that if bracket 14 is to lift a heavier part of a load, the brackets 15 and 16 will be shifted closer to bracket 14 by a distance sufficient to again balance the forces on the beam. The members 52 in each bracket will again serve to stabilize the beam 12 against distortions and deflections beyond a minimal but unharmed amount.

The hanger brackets are constructed in such a way that they can be easily removed from the beam 12, reversed top to bottom or disassembled for repair and/or replacement of damaged or worn parts. The number of stabilizer members 52 can be increased or decreased from the three shown as the demands of the assembly are varied. The parts of the brackets are each relatively simple in design so that they can be easily and readily manufactured and assembled for use. The parts are computed so that they will withstand the shearing, deflecting and collapsing loads contemplated during use of the assembly.

While this invention is susceptible of embodiment in many different forms, there are shown in the drawings and will herein be described in detail forms of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the forms illustrated.

I claim:

1. In a lifting beam assembly having a wide flange beam with top and bottom flanges joined by a web, and a plurality of axially spaced apart hanger means carried by said beam, said hanger means comprising a pair of side plates bridging the side edges of said flanges, a pair of flange plates extending between said side plates one above and one below the top and bottom flanges, at least two spaced apart holding plates operatively engaging with said side plates in juxtaposed relation with one of said flange plates, means extending between a projecting portion of said holding plates for engagement by means extending therefrom to a force exerting member, and means extending through said side plates and through said flange plates for holding said hanger means assembled.

2. In a lifting beam assembly as claimed in claim 1 wherein said last named bolt means secures said hanger means in a preselected position along the length of said beam.

3. In a lifting beam assembly as claimed in claim 1 wherein said side plates have at least two means for providing stiffening for said web.

4. In a lifting beam assembly as claimed in claim 3 wherein said last named means comprises a member secured to said side plate and projecting into the open space between said flanges and one side of said web, and the shape of said member conforming substantially to the shape of said open space in said web.

5. In a lifting beam assembly including a wide flange beam having top and bottom flanges joined by a web, a plurality of hanger means carried by said beam, each said hanger means comprising a pair of side plates extending upright across and beyond said top and bottom beam flanges, means carried by each said side plate for stiffening said web, said means for stiffening said web comprising at least two members fastened to each said side

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plate means and projecting toward said web of said beam, said stiffening means being shaped to conform to the shape of the adjacent beam whereby interference between the stiffening means and the beam will prevent web buckling, holding plate means operatively engaging with said side plates, means for holding said side plates against the beam flanges and for holding the side plates and holding plate means assembled relative to each other and relative to said beam, and means carried by said holding plate means for attachment to a force engaging member.

6. In a lifting beam assembly including a wide flange beam having top and bottom flanges joined by a web, a plurality of hanger means carried by said beam, each said hanger means comprising a pair of side plates extending upright across and beyond said top and bottom beam flanges, means carried by each said side plate for stiffening said web, holding plate means operatively engaging with said side plates, means for holding said side plates against the beam flanges and for holding the side plates and holding plate means assembled relative to each other and relative to said beam, and means carried by said holding

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plate means for attachment to a force engaging member, said holding plate means having an anchor portion and a projecting portion, said anchor portion having ears engaging with said portion of the side plates which extends beyond the adjacent beam flange, said side plates having openings to receive said ears, said side plates and holding plate means being rigidly held in assembly, and said projecting portion supporting said means for attachment to the force engaging member.

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