May 4, 1948. M. A. LONG 2,441,026

HOIST GRAPPLE

Filed Oct. 11, 1946

Fig. 1.

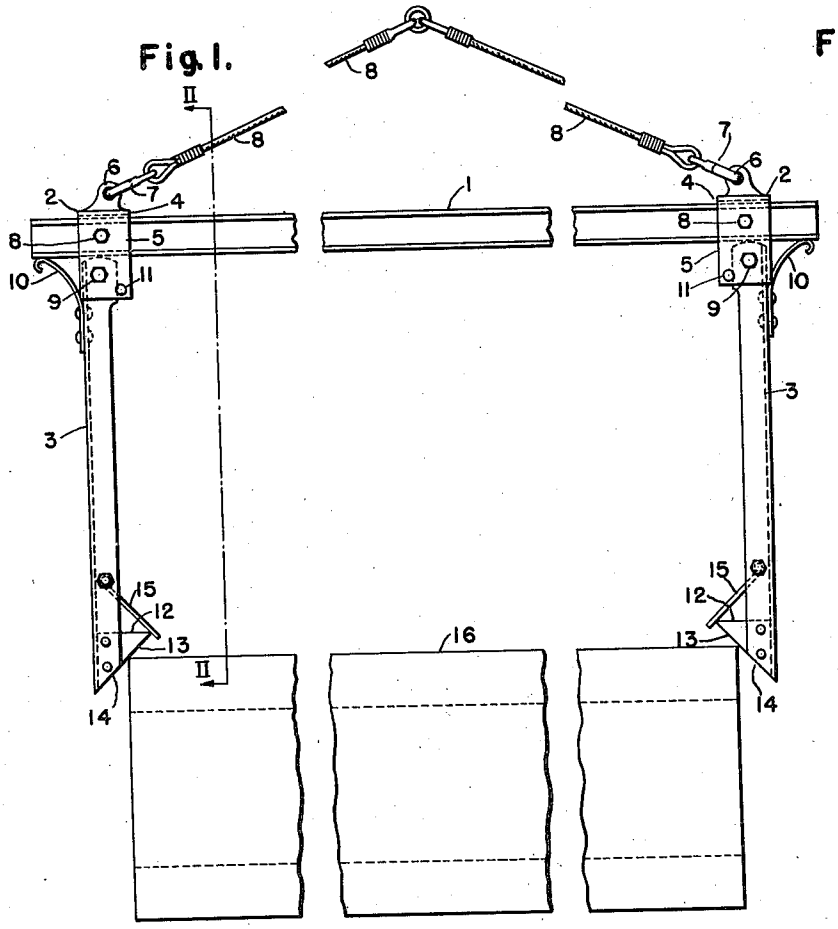


Fig. 2.

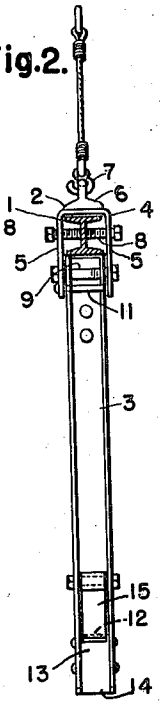


Fig. 3.

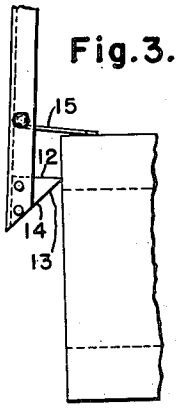


Fig. 4.

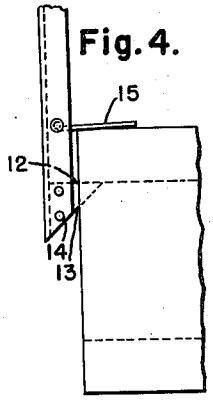


Fig. 5.

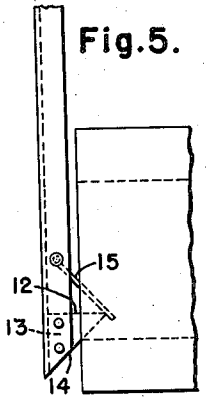
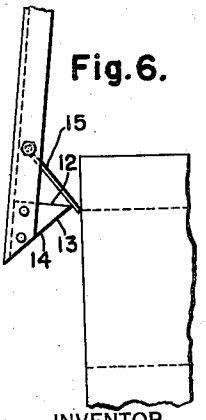


Fig. 6.



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Patented May 4, 1948

2,441,026

UNITED STATES PATENT OFFICE

2,441,026

HOIST GRAPPLE

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Application October 11, 1946, Serial No. 702,655

6 Claims. (Cl. 294—110)

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This invention relates to grapples of the type that are suspended by hoists, such as cranes, and are constructed to engage and carry pieces of work from one position to another, and has particularly to do with grapples for engaging coils of strip metal which have relatively large central openings, the coils lying with their axes in horizontal positions when engaged.

As such grapples are usually constructed, it is either necessary for a workman to manipulate them into work-engaging and work-releasing positions, or for that purpose they are provided with mechanically or electrically operated instrumentalities which add materially to the cost of the grapples and which get out of order and fail to function.

The object of the invention is to provide a grapple comprising a pair of suspended hook arms that are constructed to engage opposite ends of a piece of work when the arms are lowered to work-engaging position, and to become released from the work when the arms are lowered materially below their work-engaging position and then raised above it, both the engagement of a piece of work by the arms and the releasing of the arms from engagement with the work being effected entirely by downward and upward movements of the arms, without manual assistance and without the provision of mechanical or electrical positioning instrumentalities.

The invention is illustrated in its applicability to hoists for moving coils of strip metal whose axes extend horizontally. In the drawings, Fig. 1 is an elevation of a hoist grapple embodying the invention, the lower end of the grapple arms being immediately above a coil of strip metal; Fig. 2 a combined elevation and sectional view taken on the line II—II, Fig. 1; and Figs. 3, 4, 5 and 6 elevations of the lower end of a grapple arm and the corner of a coil adjacent to it, illustrating successive positions of the arm in engaging and releasing a coil.

The hoist grapple provided according to this invention comprises a frame which is adapted to be raised and lowered by a crane or other form of hoisting apparatus. Suspended from the frame, and pivotally mounted at their upper ends, there are a pair of grapple arms in spaced relation to each other and provided at their lower ends with opposed laterally-extending work-engaging hooks. Above the hook a pawl is pivotally connected to each arm, and is formed to extend in a downwardly inclined direction from its pivot point and to rest at its lower end upon and project beyond the hook. The grapple arms are so adjusted on the frame with relation to each other that, when they extend vertically downwardly, their adjacent vertical sides are spaced from each other a distance which is substantially equal to the width of the strip that forms a coil. When the grapple arms are lowered to engage a coil that is lying on its side, their lower ends are pressed outwardly by the coil until their hook ends register with and move into the central opening of the coil, and the pawls are swung upwardly. After the coil has been moved and lowered upon a support, the grapple arms are lowered to such extent that the tops of the upwardly-swung pawls lie below the inner face of the top portion of the coil. The pawls then swing downwardly to their normally downwardly-inclined positions with their end portions resting upon the tops of the arm hooks. By then moving the arms upwardly, the pawls engage the inner face of the top portion of the coil and move the lower ends of the arms outwardly free from engagement with the coil.

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Referring to the embodiment of the invention illustrated in the drawings, the hoist frame preferably comprises a horizontal boom which may be an I-beam 1. Borne by the boom and adjustable longitudinally of it, there are two brackets 2, from each of which there is suspended a grapple arm 3. Each bracket 2 comprises base 4 that rests upon the top of boom 1, and sides 5 that extend downwardly at the sides of the boom. Each base 4 is provided with an eye 6 adapted to be engaged by a hook 7 attached to a cable 8 which is supported by a hoist adapted to be lowered and raised. To variably position brackets 2 upon boom 1, the sides 5 of each may be provided with threaded set-bolts 8 whose inner ends bear against the web of the boom.

Each arm 3 may be in the form of a channel whose upper end is pivotally mounted in the sides 5 of a bracket 2 by a pin 9 which extends through such sides and the flanges of the channel. Preferably, the lower ends of the grapple arms are yieldingly urged towards each other, and for this purpose a leaf spring 10 may be attached at its lower end to the back of each arm and bear at its upper end against the lower flange or boom 1. To prevent the lower end of each arm from swinging towards the other arm beyond a substantially vertical position, the lower portion of sides 5 of each bracket 2 is provided with a stop in the form of a pin 11 that is adapted to be engaged by the front of the arm below pivot pin 9 when the arm is in a substantially vertical position.

At its lower end, each arm 3 is provided with a laterally-extending hook 12 which is formed by

the lower ends of the flanges of the arm and a block 13 positioned between and connected to such flanges. Below hook 12 each arm is provided with a face 14 that inclines downwardly from the outer end of the hook to cause the arm to swing outwardly when it strikes the top of a coil. Above the hook on each arm there is a pawl 15 whose upper end is pivotally connected to the base of the channel that forms the arm. Normally the pawl lies in the downwardly-inclined position shown in Fig. 1, the pawl being of such length that its lower end then extends beyond the outer end of hook 12.

In Fig. 1 the hoist grapple is shown in such position that the bottoms of its hooks 12 are immediately above a coil 16, brackets 2 having previously been so positioned upon boom 1 that the adjacent edges of the flanges of arms 3 are spaced from each other a distance slightly greater than the width of the strip that constitutes the coil. Such adjustment of the brackets occurs infrequently because, in a strip-rolling mill where coils of strip are moved by hoists, the usual practice is to roll a large amount of strip metal of one width before changing the mill to roll strip of another width.

When the hoist is lowered from the position shown in Fig. 1, the lower incline faces 14 of hooks 12 strike the top of coil 16 and cause the lower ends of the arms to swing outwardly to the position indicated in Fig. 3. In such lowering of the hoist, the outer projecting ends of pawls 15 are engaged by the top of the coil and the pawls are swung upwardly to the postion also indicated in Fig. 3. When hooks 12 have been so lowered that their tops are below the inner face of the top portion of coil 16, the arms swing downwardly by gravity to a vertical position, or are pressed downwardly and towards each other to a vertical position by springs 10, and by such movement of the arms their hooks engage the coil in the manner shown in Fig. 4. With the coil thus engaged by the hooks of the grapple arms, it may be elevated and moved to any desired position. After the coil has been lowered upon a support, the arms are further lowered to the position shown in Fig. 5 in which pawls 15 are free to swing downwardly within the central opening of the coil to their normal downwardly-inclined positions in which their outer ends rest upon the outer ends of hooks 12. When the hoist is thereafter raised, the outer faces of pawls 15 bear upon the ends of the inner face of coil 16 and press the lower ends of arm 3 outwardly to release their hooks from the coil.

It is apparent from the foregoing explanation of their operation that grapple arms automatically engage a coil, or a similarly shaped article, by the mere lowering of the hoist to the position required for engaging the coil. This is done without the necessity of a workman manipulating the arms, and without providing a hoist with special instrumentalities for mechanically or electrically causing the arms to move to coil-engaging position. Similarly, after a coil has been moved and lowered upon a support, it is only necessary to further lower the hoist and then raise it to cause the grapple arms to disengage the coil.

According to the provisions of the patent statutes, I have explained the principle and operation of my invention, and have illustrated and described what I now consider to be the best embodiment of it. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced by other

forms of construction than as specifically illustrated and described.

I claim:

1. A hoist grapple comprising a frame adapted to be raised and lowered, a pair of arms pivotally connected at their upper ends to said frame and suspended therefrom in spaced relation to each other, the lower ends of said arms being provided with opposed laterally-extending work-engaging hooks, and a pawl pivotally connected to each arm above its hook and normally extending in a downwardly inclined direction from its pivot point and resting at its lower end upon and projecting beyond said hook, said pawls being formed and positioned to swing upwardly by their contact with a piece of work when said arms are lowered to a position in which their hooks engage the work and to swing downwardly to their said normal position when the arms are lowered below work-engaging position, whereby the pawls then cause the hook ends of the arms to swing outwardly beyond work-engaging positions when the arms are moved upwardly.

2. A hoist grapple comprising a horizontal boom adapted to be raised and lowered, a pair of arms pivotally connected at their upper ends to said frame and suspended therefrom in spaced relation to each other, means for adjusting said arms upon the boom to vary the space between them, the lower ends of said arms being provided with opposed laterally-extending work-engaging hooks, and a pawl pivotally connected to each arm above its hook and normally extending in a downwardly inclined direction from its pivot point and resting at its lower end upon and projecting beyond said hook, said pawls being formed and positioned to swing upwardly by their contact with a piece of work when said arms are lowered to a position in which their hooks engage the work and to swing downwardly to their said normal position when the arms are lowered below work-engaging position, whereby the pawls then cause the hook ends of the arms to swing outwardly beyond work-engaging positions when the arms are moved upwardly.

3. A hoist grapple comprising a horizontal boom adapted to be raised and lowered, a pair of brackets borne by said boom and adjustable longitudinally thereof to vary the space between them, an arm pivotally connected at its upper end to each of said brackets and suspended therefrom, the lower ends of said arms being provided with opposed laterally-extending work-engaging hooks, and a pawl pivotally connected to each arm above its hook and normally extending in a downwardly inclined direction from its pivot point and resting at its lower end upon and projecting beyond said hook, said pawls being formed and positioned to swing upwardly by their contact with a piece of work when said arms are lowered to a position in which their hooks engage the work and to swing downwardly to their said normal position when the arms are lowered below work-engaging position, whereby the pawls then cause the hook ends of the arms to swing outwardly beyond work-engaging positions when the arms are moved upwardly.

4. A hoist grapple comprising a frame adapted to be raised and lowered, a pair of arms pivotally connected at their upper ends to said frame and suspended therefrom in spaced relation to each other, the lower ends of said arms being provided with opposed laterally-extending work-engaging hooks, means for yieldingly urging the hook ends of said arms towards each other, stops for pre-

venting the hook ends of said arms from moving towards each other beyond substantially vertical positions of the arms, and a pawl pivotally connected to each arm above its hook and normally extending in a downwardly inclined direction from its pivot point and resting at its lower end upon and projecting beyond said hook, said pawls being formed and positioned to swing upwardly by their contact with a piece of work when said arms are lowered to a position in which their hooks engage the work and to swing downwardly to their said normal position when the arms are lowered below work-engaging position, whereby the pawls then cause the hook ends of the arms to swing outwardly beyond work-engaging positions when the arms are moved upwardly.

5. A hoist grapple comprising a horizontal boom adapted to be raised and lowered, a pair of brackets slidably borne by said boom and adjustable longitudinally thereof to vary the space between them, an arm pivotally connected at its upper end to each of said brackets and suspended therefrom, the lower ends of said arms being provided with opposed laterally-extending work-engaging hooks, means for yieldingly urging the hook ends of said arms towards each other, stops borne by said brackets for preventing the hook ends of said arms from moving towards each other beyond substantially vertical positions of the arms, and a substantially straight pawl pivotally connected at one end to each arm above its hook and normally extending in a downwardly inclined direction from its pivot end and resting at its lower end upon and projecting beyond said hook, said pawls being formed and positioned to swing upwardly by their contact with the top of

a piece of work when said arms are lowered to a position in which their hooks engage the work and to swing downwardly to their said normal position when the arms are lowered materially below work-engaging position, whereby when the arms are then moved upwardly the upper faces of the pawls engage the work and cause the hook ends of the arms to swing outwardly beyond work-engaging positions.

6. A hoist grapple for engaging and moving coils of strip metal which have large central openings that extend horizontally, comprising a frame adapted to be raised and lowered, a pair of arms pivotally connected at their upper ends to said frame and suspended therefrom in spaced relation to each other, the lower ends of said arms being provided with opposed laterally-extending work-engaging hooks, and a pawl pivotally connected to each arm above its hook and normally extending in a downwardly inclined direction from its pivot point and resting at its lower end upon and projecting beyond the hook, said pawls being formed and positioned to swing upwardly by their contact with the top of a horizontally positioned coil when said arms are lowered to a position in which their hooks engage to engage the inner face of the top portion of such coil and to swing downwardly to their said normal position when the arms are lowered to a position in which the upper ends of the upwardly-swung pawls are below the inner face of the top portion of the coil, whereby the pawls then cause the hook ends of the arms to swing outwardly beyond the ends of the coil when the arms are moved upwardly.

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