Nov. 15, 1966 P. L. DUKES 3,285,650

HOOK

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Fig 1

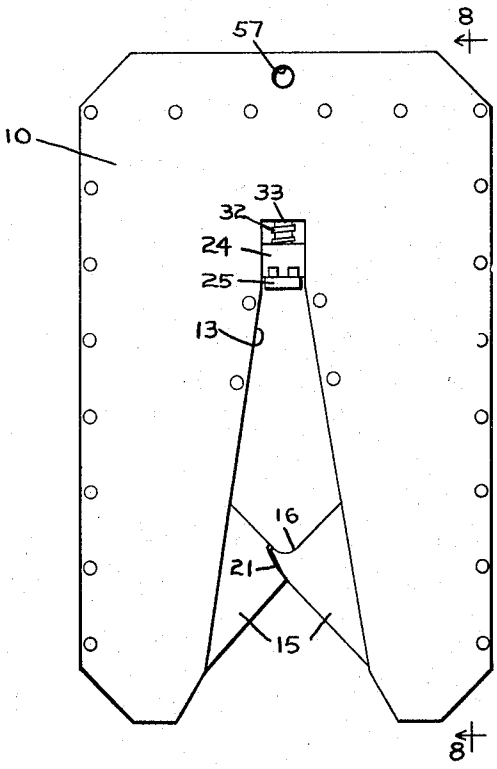


Fig 2

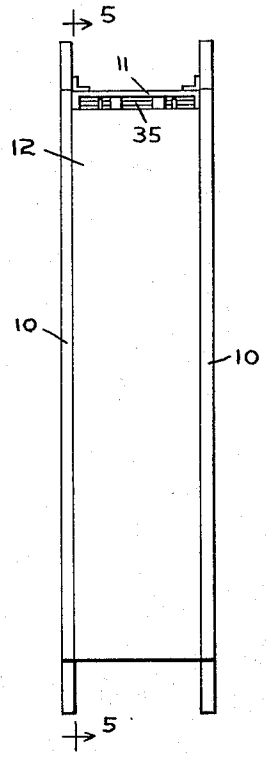


Fig 3

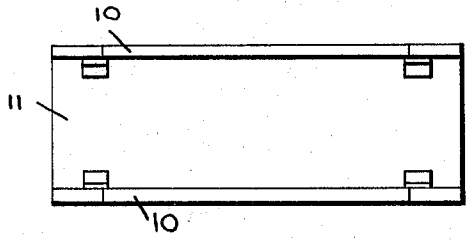
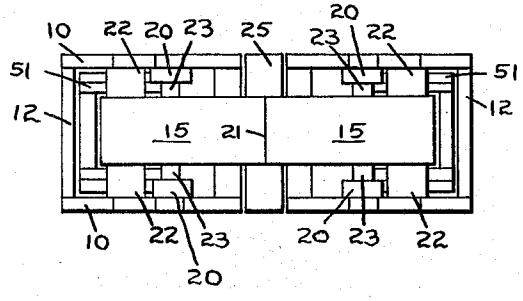


Fig 4



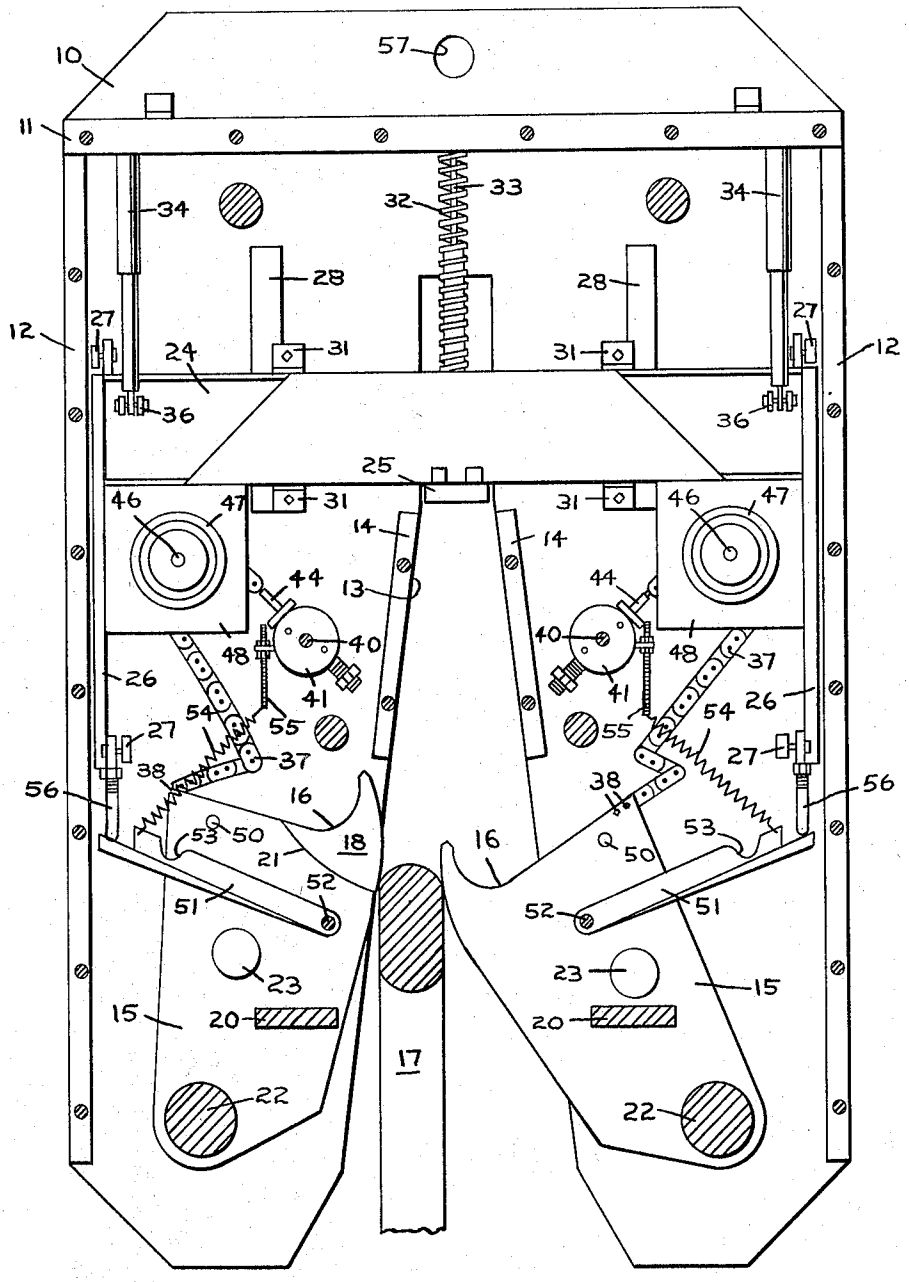
INVENTOR.
PERRY L. DUKES
BY Wells & St. John
ATTYS.

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Fig 5



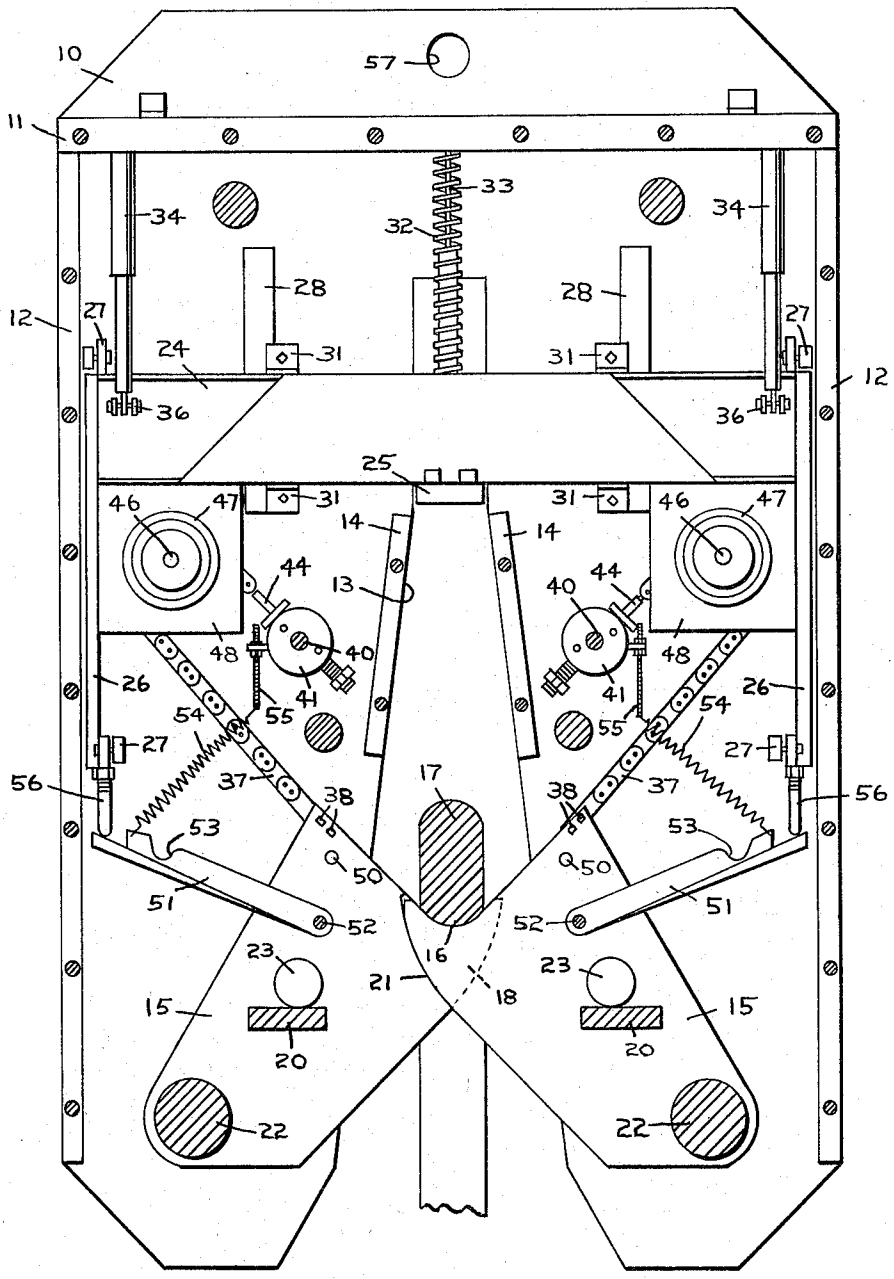
INVENTOR.
PERRY L. DUKES
BY Wells & St. John
ATTYS.

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Fig 6



INVENTOR.
PERRY L. DUKES

BY Wells & St. John

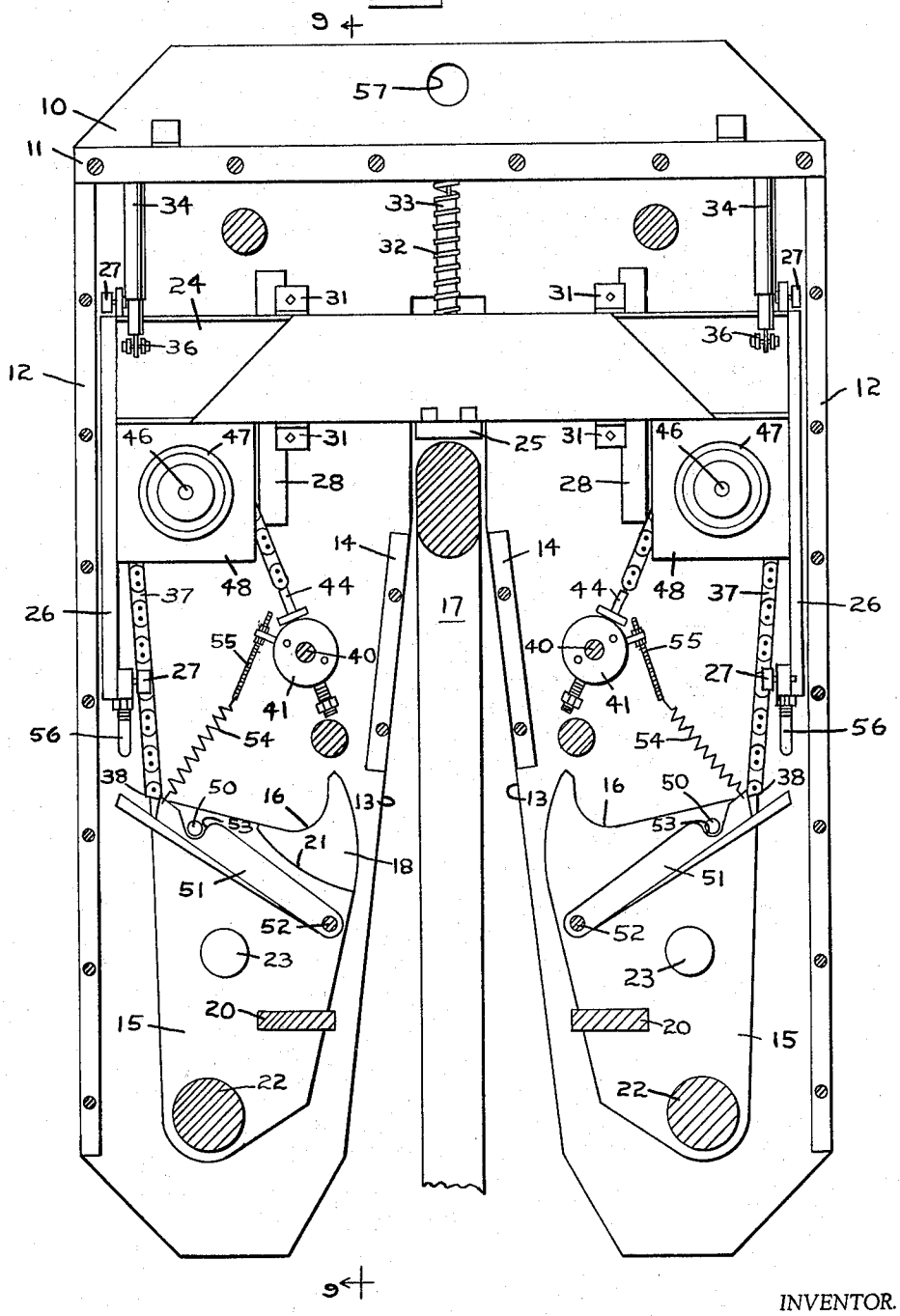
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Fig 7



INVENTOR.
PERRY L. DUKES

BY Wells & St. John

ATTYS.

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Fig 8

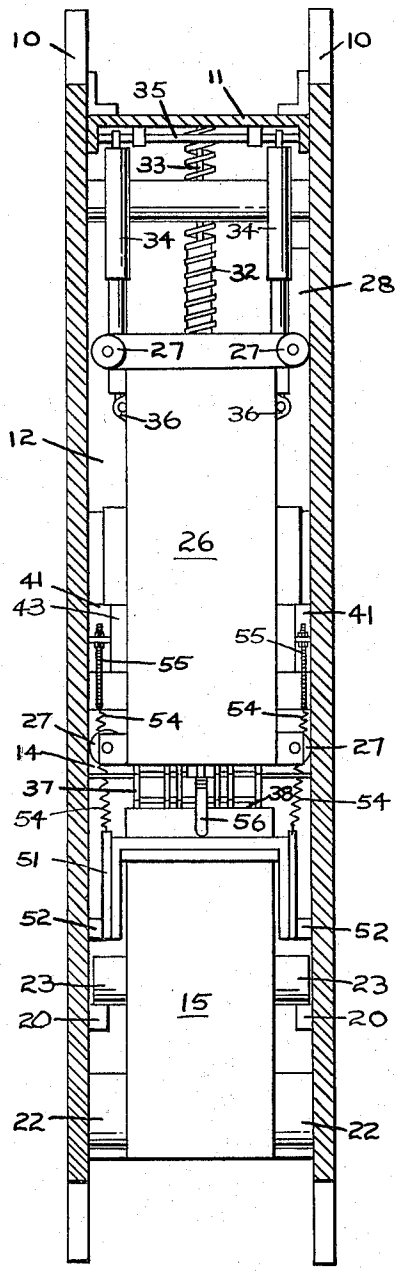
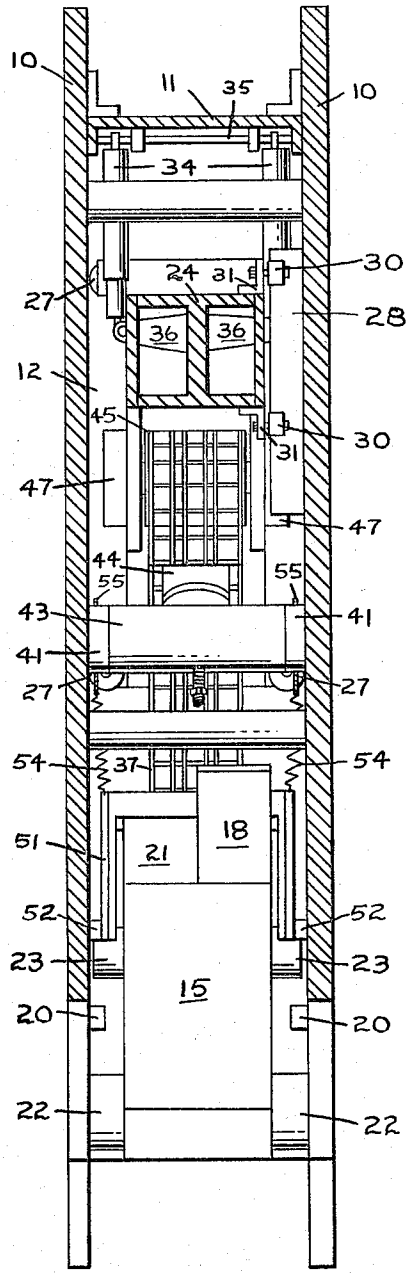


Fig 9



INVENTOR.
PERRY L. DUKES
BY Wells & St. John
ATTYS.

United States Patent Office 3,285,650 Patented Nov. 15, 1966

3,285,650

HOOK

Perry L. Dukes, Goldendale, Wash., assignor, by mesne assignments, to SoMaeCo-D-Inc., Kennewick, Wash., a corporation of Washington

Filed Jan. 18, 1965, Ser. No. 426,081
7 Claims. (Cl. 294—83)

This invention relates to a novel hook for use on a hoist adapted to lift an article having a rigid upright bail.

The present invention is concerned with a hook for carrying heavy objects, such as buckets of concrete, by means of a mobile hoist or crane. The hook is adapted to automatically engage the bail of an article and to automatically release the bail when the article has been safely lowered into ground contact. It is specifically designed to prevent the possibility of disengagement of the article while in a lifted position.

It is a first object of this invention to provide such a hook that can fit down upon a bail with a limited amount of precision, the jaws of the hook being adapted to receive the bail over a wide latitude of positions.

Another object of this invention is to provide a hook whose jaws are automatically closed due to their own weight at all times except when the hook has been lowered onto the bail so that the weight of the hook itself rests on the bail. In this manner, accidental disengagement of the hook while the article is in a lifted position is entirely eliminated.

Another object of this invention is to provide such a device that can be manufactured with a rigid protective housing so that the interior moving elements of the hook are not subject to accidental damage.

Another object of this invention is to provide such a device that is rather simple from a mechanical standpoint and which can be subjected to heavy usage without the danger of accidental damage. If damage should occur to any part, the load carried by the hook cannot disengage accidentally while in a lifted position.

These and further objects will be evident from a study of the following disclosure which relates to the illustrated embodiment of the invention. It is to be understood that this embodiment of the invention, while exemplary of the apparatus desired, is not intended to restrict or limit the scope of the invention defined in the appended claims.

In the drawings:

FIGURE 1 is a side elevation view of the hook;

FIGURE 2 is an end view of the hook as seen from the right in FIGURE 1;

FIGURE 3 is a top view of the hook shown in FIGURE 1;

FIGURE 4 is the bottom view of the hook shown in FIGURE 1;

FIGURES 5, 6 and 7 are enlarged sectional views of the hook as seen along line 5—5 in FIGURE 2, illustrating the operating positions of the hook;

FIGURE 5 shows the entry of a bail past the movable jaws;

FIGURE 6 shows the carrying of a bail by the hook and jaws;

FIGURE 7 shows the jaws in their fully retracted positions prior to removal of the bail from the hook;

FIGURE 8 is an enlarged sectional view taken along line 8—8 in FIGURE 1; and

FIGURE 9 is an enlarged sectional view of the hook as seen along line 9—9 in FIGURE 7.

The hook shown in the attached drawings was designed principally for use on heavy construction projects for carrying large buckets of concrete on a conveying hoist. The sheer weight of such buckets makes imperative the safe transporting of the loads over a work area. They must be carried by a hook which is incapable of accidentally dropping the bucket. The present hook was designed principally with that purpose in mind, also taking into account the usage made of such a hook on a construction project, and the requirement for simple repair procedures when required.

The hook basically comprises a pair of upright side plates **10** having a general rectangular configuration. The upper ends of the side plates **10** are connected by a cover **11** which serves as a structural brace to rigidly space the plates **10** from one another. The plates **10** are also connected by protective end plates **12** that join the plates **10** at their respective ends. The cover **11** and plates **12** are connected to the side plates **10** by a series of releasable bolts so that they can be removed when necessary.

The two side plates **10** are identical to one another. Each includes a tapered slot **13** that is enlarged at its lower end. The slots **13** extend upwardly from the bottom end of each side plate in registry with one another and terminate short of the upper end of each side plate **10** as shown in FIGURE 1. Along the upper portion of the sides of each slot **13** are connecting inside plates **14** joining the two side plates **10** for additional rigidity. Plates **14** also serve to protect the interior of the hook from possible damage. The slots **13** and the boundary plates **14** define a throat in the rigid structure just described within which can be received the bail of the article to be hoisted. The enlarged taper at the bottom end of the slot **13** permits the plates **10** to be lowered onto the bail with a minimum of accuracy, since the hook will be automatically guided on the bail as it is lowered into direct engagement with it.

The hook has a pair of heavy jaws **15** pivoted between the side plates **10** adjacent to their lower ends. The two jaws **15** are located at each side of the slot **13** respectively. Jaws **15** are complementary to one another and each includes an upper surface **16** adapted to cradle a bail **17** for lifting purposes as shown in FIGURE 6. The two jaws **15** are identical. Each terminates at an overlapping extended hook portion **18** capable of carrying a bale alone if necessary. The respective portions **18** are each half the thickness of the respective jaws **18** and are formed at an abutting surface **21** on each of the jaws **15**, the abutting surfaces **21** being in actual contact with one another when the jaws **13** are fully closed (see FIGURE 6).

Each jaw **15** is pivotally mounted between the two side plates **10** about a horizontal axis defined by a thin axle **22** rotatably journalled by each side plate **10**. Since the width of the jaws **15** is less than the separation between the side plates **10**, pins **23** received within apertures in each jaw **15** protrude to the sides of the jaws. Pins **23** rest on welded bars **20** fixed to the inner surfaces of the plates **10** to limit downward motion of the respective jaws, which do not always drop closed in unison. It is important to note, as can be seen in FIGURE 7, that the center of gravity of each jaw **15** is always located between the central axis of the pin axle **22** and the throat formed by slots **13** and is above the elevation of the axis of the pin axle **22**. Thus, each jaw **15** is biased to its closed position as shown in FIGURE 6, due to its own weight. The jaws **15** are freely pivoted about the pin axles **22** and upward motion of each jaw **15** is resisted only by the weight of that jaw.

The only mechanical operating device contacted by the bail **17** in the operation of this hook is an abutment beam **24** that is located between the hook **10** and above the jaws **15**. The abutment beam **24** has a reinforcing contact block **25** in the throat formed by the slots **13**. The block **25** extends into the respective slots **13** and terminates flush with the outer surfaces of the side plates **10**.

Fixed to each end of the abutment **24** are downwardly extending end plates **26** formed as rigid extensions of beam **24**. Mounted at the top and bottom portions of end plates **26** are rollers **27** adapted to roll along the inside surfaces of the respective side plates **10** contacted thereby. The rollers **27** provide the necessary guidance and frictional reduction for proper vertical movement of beam **24** relative to the plates **10**.

Fixed to the inside surface of the side plate **10** shown in the background in FIGURES 5 through 7 are a pair of laterally spaced vertical guide plates **28**. The guide plates **28** are contacted by upper and lower rollers **30** mounted on brackets **31** fixed to the abutment beam **24**. The vertically aligned rollers **30** assure proper vertical guidance for the abutment beam **24** as it moves relative to the plates **10**.

The abutment beam **24** is biased in a downward direction both by its own weight and by a compression spring **32** wrapped about a telescoping rod **33** whose upper section is fixed to the cover **11** and whose lower section is fixed to the beam **24**. At each end of the beam **24** are a pair of hydraulic retarding cylinders **34**. The upper end of each cylinder **34** is mounted on a cross shaft **35** between the plates **10**. The lower end of each cylinder **34** is connected to a bracket **36** on the beam **24**. The retarding cylinders **34** slow downward movement of the beam **24** relative to plates **10** and also limit the extent of such downward movement by defining the lowermost position of the beam **24**. This position is that illustrated in FIGURES 5 and 6.

The jaws **15** must be mechanically opened in order to release the bail **17**. This is accomplished by means of a roller chain **37** on each jaw **15**. Since the various mechanical devices that control each jaw **15** are identical, although being entirely independent, the apparatus concerned with a single jaw will be described below, it being understood that an identical apparatus is utilized to control the remaining jaw **15**.

One end of the roller chain **37** is fastened at **38** to the upper end of the jaw **15**. The remaining end of the roller chain **37** is fastened to an anchor bolt **44** slidably received within a roller **43** and spring loaded in a longitudinal direction to absorb shock in the chain **37**. The roller **43** is rotatably carried between the side plates **10** by a pair of spacing collars **41** and stub shafts **40** that extend into the side plates **10** as well as the roller **43**. The spacers **41** are non-rotatably carried between the plates **10**.

The chain **37** is entrained over a roller **45** journalled on a shaft **46** which in turn is rotatably carried by bearings **47**. The bearings **47** are located on mounting plates **48** fixed to the abutment beam **24**. Thus, upward movement of the beam **24** and roller **45** will cause the lower end of the chains **37** to lift the jaws **15** to retract the jaws **15** between the plates **10** at positions located beyond the throat formed by the slots **13**.

Each jaw **15** is provided with a pair of retaining pins **50** fixed to and protruding outwardly along each side surface thereof. Each pin **50** is adapted to be engaged by a movable latch member **51** that is pivoted to the side plates **10** by a shaft **52**. The latch members **51** are U-shaped, and straddle the intermediate portions of the jaws **15**. Each latch member **51** is provided with a pair of notches **53** in registry with one another repectively adapted to receive the retaining pins **50** when the jaws **15** are fully opened by action of the chain **37** (FIGURE 7).

The latches **51** are biased upwardly by means of tension springs **54** connected between the latches **51** and an adjustable anchor bolt **55** on each of the spacers **41** previously described.

At the lower end of each plate **26** on the abutment beam **24** is an adjustable release bolt **56** adapted to contact the top outer surface of the latch member **51** when the beam **24** is in its lowermost position (FIGURES 5 and 6). When the beam **24** has been raised by contact with a bail **17**, the bolts **56** will be disengaged from the latch members **51** and the upward movement of the latch members **51** will be limited only by engagement with the retaining pins **50** on the jaws **15**.

The operation of the hook, suspended from a hoist by means of top apertures **57**, is completely automatic and requires no external manipulation other than operation of the hoist itself. As shown in FIGURE 5, initial lowering of the hook over a bail **17** will cause one or both jaws **15** to be freely pivoted upwardly so that the bail **17** can pass their respective abutting surfaces **21**. The tapered nature of the throat formed by slots **13** will permit the hook to accommodate a bail **17** without extremely accurate placement of the hook relative to the bail. As the hook is lowered over the bail **17**, the slot **13** will guide the hook into the proper position and the jaws **15** will close due to their own weight when they are no longer contacted by the bail **17**.

The hook and load is lifted with the jaws in their closed position as shown in FIGURE 6. The article is then transferred to the position where it is desired and it is impossible for the jaws **15** to release since their own weight, as well as the force exerted by the bail **17**, will serve to maintain the jaws **15** in their respective abutting positions.

The jaws **15** can only be released when the weight of the bail **17** has been removed from them. This is accomplished when the article carried by the bail **17** has again been provided with vertical support, so that the weight of the hook can cause the beam **24** to be raised due to downward movement of the plates **10** over the bail **17** as shown in FIGURE 7. The upward movement of the beam **24** relative to the downwardly moving plates **10** will cause the chains **37** to pivot the jaws **15** to the position shown in FIGURE 7 where the retaining pins **50** are received within the notches **53** of the latch members **51**. At this time, the hook can be raised from the bail **17** since the jaws **15** are restrained from falling back across the throat formed by the slots **13** due to the mechanical engagement of the pins **50** by the latch members **51**.

When the weight of the beam **24** no longer rests on the bail **17** due to lifting of the hook, the beam **24** will begin to move downwardly due to its own weight. The downward movement of beam **24** is slowed by the hydrulic retarding cylinders **34**, but eventually the latch members **51** will be contacted by the downwardly moving bolts **56** at the lower ends of the plates **26** and the latch members **51** will be pivoted downwardly to release the respective pins **50**. The jaws **15** will then pivot back into the positions shown in FIGURE 6 and the apparatus will again be in condition for reception of another bail prior to lifting it.

In actual practice, the retarding cylinders **34** are designed to permit the downward movement of beam **24** over a distance of six inches in approximately 5 seconds. This is sufficient time to lift the hook from its position over the bail **17** and permits the hook to be immediately used to lift another article.

It is important to note that the pins **50** cannot be engaged by the latch member **51** at each side of the hook unless the beam **24** has been raised by lowering the hook into contact with the bail in the manner shown in FIGURE 7. As shown in FIGURE 5, a jaw **15** can be urged by a bail **17** to a position flush with the slot **13**, without accidentally engaging the pins that would hold it in its open position. This is insured by the fact that additional movement, as shown in FIGURE 7, is required in order to engage the pins **50** and also by the fact that the beam **24** will be in its lowermost position so that the latch members **51** are below the path of movement of the pins **50**. There is no way in which the jaws **15** can be accidentally locked in an open position except by raising the beam **24**.

The jaws **15** abut one another in their closed position as shown in FIGURE 6 during the time in which a load is carried by them. If a connection in one of the chains **37**

should break, the jaws **15** would not move and the load would not be dropped. The jaws **15** support each other and provide a rigid bridge across the throat that can safely carry large loads without danger of disengagement.

Modifications could be made in this basic structure without deviating from the basic concept of an efficient, safe and strong hook for construction hoisting purposes. For these reasons only the following claims are intended to limit or define the scope of my invention.

Having thus described my invention, I claim:

1. A hook for a hoist adapted to carry an article having an upstanding bail comprising:

a pair of upright side plates fixed relative to one another in a spaced relation, each of said plates being provided with a vertically disposed slot extending from the lower end thereof and terminating short of the upper end of said plate, the slots being in registry with one another and providing an open throat to receive a bail of an article to be lifted;

a pair of movable jaws pivotally mounted between said plates about parallel transverse horizontal axes, said jaws being located adjacent the lower ends of said plates at each side of the slots forming said throat, said jaws each being biased to a first position protruding into the throat and being each movable to a second position fully recessed beyond said throat;

a vertically reciprocable abutment member mounted on said plates above said jaw, said abutment member being in a location bridging said throat;

motion limiting means operatively connected between said abutment means and said plate to limit the extent of downward motion of said abutment member relative to said plates;

lifting means operatively connected between said abutment member and said jaws to cause said jaws to be moved to their second positions in response to predetermined upward motion of said abutment member relative to said plates;

latch means on said jaws and said plates engageable when said jaws attain their second positions to selectively prevent motion of said jaws relative to said plates;

and means on said abutment member operatively engageable with said latch means to release said latch means when said abutment member is in its lowermost position relative to said plates and allow said jaws to return to their first positions.

2. A hook for a hoist adapted to carry an article having an upstanding bail, comprising:

a pair of parallel upright side plates fixed relative to one another in a spaced relation, each of said plates being provided with a vertically disposed slot extending from the lower end thereof and terminating short of the upper end of said plates, the slots being in registry with one another and providing a throat to receive a bail of an article to be lifted;

a pair of complementary movable jaws pivotally mounted between said plates about parallel transverse horizontal axes, said jaws being located adjacent the lower end of said plates at each side of the slots forming said throat, each jaw including a complementary abutting surface adapted to contact one another at the center line of the throat formed by the slots to thereby bridge the area formed by the slots, the center of gravity of each jaw being located between its pivotal axis relative to said plates and the throat formed by said slots and being at an elevation above that of its pivotal axis on said plates, said jaws each being biased to a first position protruding into the throat due to the location of their centers of gravity and being movable to a second position recessed beyond the edges of said plates defining said slots;

a vertically recepricable abutment member mounted on said plates above said jaw, said abutment member being in a location bridging said throat;

motion limiting means operatively connected between said abutment means and said plate to limit the extent of downward motion of said abutment member relative to said plates;

lifting means operatively connected between said abutment member and said jaws to cause said jaws to be moved to their second positions in response to predetermined upward motion of said abutment member relative to said plates;

latch means on said jaws and said plates engageable when said jaws attain their second positions to selectively prevent motion of said jaws relative to said plates;

and means on said abutment member operatively engageable with said latch means to release said latch means when said abutment member is in its lowermost position relative to said plates and allow said jaws to return to their first positions.

3. A hook for a hoist adapted to carry an artcle having an upstanding bail, comprising:

a pair of parallel upright side plates fixed relative to one another in a spaced relation, each of said plates being provided with a vertically disposed slot extending from the lower end thereof and terminating short of the upper end of said plates, the slots being in registry with one another and providing a throat to receive a bail of an article to be lifted;

a pair of complementary movable jaws pivotally mounted between said plates about parallel transverse horizontal axes, said jaws being located adjacent the lower end of said plates at each side of the slots forming said throat, each jaw including a complementary abutting surface adapted to contact one another at the center line of the throat formed by the slots to thereby bridge the area formed by the slots, the center of gravity of each jaw being located between its pivotal axis relative to said plates and the throat formed by said slots and being at an elevation above that of its pivotal axis on said plates, said jaws each being biased to a first position protruding into the throat due to the location of their centers of gravity and being movable to a second position recessed beyond the edges of said plates defining said slots;

a vertically reciprocable abutment member mounted on said plates above said jaw, said abutment member being in a location bridging said throat;

spring means operatively connected between said plates and said abutment member urging said abutment member downwardly relative to said plates;

hydraulic retarding cylinder means connected between said plates and said abutment member to retard the rate of downward movement of said abutment member relative to said plates and to limit the amount of said downward movement to thereby define the lowermost position of said abutment member relative to said plates;

a pair of roller chains respectively anchored to the upper end of said jaws, the remaining ends of said chains being anchored between said plates in a fixed pivotal connection;

a pair of rollers mounted on said abutment member and respectively having said chains entrained over them intermediate the ends of said chains, whereby upward movement of said abutment member relative to said plates will cause said chains to lift said jaws and pivot them about their pivotal axes relative to said plates;

latch means on said jaws and said plates engageable when said jaws attain their second positions to selectively prevent motion of said jaws relative to said plates;

and means on said abutment member operatively en-

gageable with said latch means to release said latch means when said abutment member is in its lowermost position relative to said plates and allow said jaws to return to their first positions.

4. A hook for a hoist adapted to carry an article having an upstanding bail, comprising:

a pair of parallel upright side plates fixed relative to one another in a spaced relation, each of said plates being provided with a vertically disposed slot extending from the lower end thereof and terminating short of the upper end of said plates, the slots being in registry with one another and providing a throat to receive a bail of an article to be lifted;

a pair of complementary movable jaws pivotally mounted between said plates about parallel transverse horizontal axes, said jaws being located adjacent the lower end of said plates at each side of the slots forming said throat, each jaw including a complementary abutting surface adapted to contact one another at the center line of the throat formed by the slots to thereby bridge the area formed by the slots, the center of gravity of each jaw being located between its pivotal axis relative to said plates and the throat formed by said slots and being at an elevation above that of its pivotal axis on said plates, said jaws each being biased to a first position protruding into the throat due to the location of their centers of gravity and being movable to a second position recessed beyond the edges of said plates defining said slots;

a vertically reciprocable abutment member mounted on said plates above said jaw, said abutment member being in a location bridging said throat;

yieldable means operatively connected between said plates and said abutment member urging said abutment downwardly relative to said plates;

a hydraulic retarding cylinder connected between said plates and said abutment member to retard the rate of downward movement of said abutment relative to said plates and to limit the amount of said downward movement to thereby define the lowermost position of said abutment member relative to said plates;

a pair of roller chains respectively anchored to the upper end of said jaws, the remaining ends of said chains being anchored between said plates in a fixed pivotal connection;

a pair of rollers mounted on said abutment member and respectively having said chains entrained over them intermediate the ends of said chains, whereby upward movement of said abutment member relative to said plates will cause said chains to lift said jaws and pivot them about their pivotal axes relative to said plates;

a pair of fixed pins protruding outwardly respectively from each of said jaws toward the adjacent side plate;

a pivoted latch carried by said side plates intermediate the jaws and said side plates and located directly below said pins, said latch members each having upwardly open notches to selectively receive said pins;

yieldable means operatively connected between said latch members and said side plates to bias the latch members upwardly against said pins;

and an abutment formed at the lower portion of said abutment member engageable with each of said latch members when said abutment member is in its lowermost position to thereby pivot said latch members about their axes relative to said side plates so as to position the latch members below the path of movement of the pins.

5. A hook for a hoist adapted to carry an article having an upstanding bail comprising:

a rigid frame;

movable jaw means pivotally mounted on said frame about a horizontal transverse axis, said jaw means

comprising a first section including a protruding upwardly directed bail engaging surface adapted to support the lower surface of a bail carried thereby, said jaw section being biased to a first position relative to said frame wherein the bail engaging surface thereof extends across a plane on said frame in vertical alignment with a bail to be supported thereby, said jaw section being selectively movable about said axis to a second position relative to said frame wherein said bail engaging surface is retracted beyond said plane;

retracting means on said jaw selectively activated by downward motion of the frame relative to a bail aligned with said plane on said frame beyond the elevation at which the bail engaging surface of said jaw section is in contact with the bail to selectively shift said jaw from said first position to said second position;

and retarding means operatively connected to said jaw means to delay return of said jaw section to said first position subsequent to shifting thereof to said second position.

6. A hook for a hoist adapted to carry an article having an upstanding bail, comprising:

a pair of upright side plates fixed relative to one another in a spaced relation, each of said plates being provided with a vertically disposed slot extending from the lower end thereof and terminating short of the upper end of said plate, the slots being in registry with one another and providing a throat to receive a bail of an article to be lifted;

a movable jaw pivotally mounted between said plates about a transverse horizontal axis, said jaw being located adjacent the lower ends of said plates at one side of the slots forming said throat, said jaw being biased to a first position protruding into the throat and being movable to a second position fully recessed beyond said throat;

a vertically reciprocable abutment member mounted on said plates above said jaw, said abutment member being in a location bridging said throat;

motion limiting means on said abutment means and said plates to limit the extent of downward motion of said abutment member relative to said plates;

lifting means operatively connected between said abutment member and said jaw to cause said jaw to be moved to its second position in response to predetermined upward motion of said abutment member relative to said plates;

latch means on said jaw and said plates engageable when said jaw attains its second position to selectively prevent motion of said jaw relative to said plates;

and means on said abutment member operatively engageable with said latch means to release said latch means when said abutment member is in its lowermost position relative to said plates;

said motion limiting means comprising hydraulic retarding cylinders connected between the upper ends of the plates and said abutment means to control the rate of downward movement of said abutment member relative to said plates as well as the extent of such movement.

7. A hook for a hoist adapted to carry an article having an upstanding bail, comprising:

a pair of upright side plates fixed relative to one another in a spaced relation, each of said plates being provided with a vertically disposed slot extending from the lower end thereof and terminating short of the upper end of said plate, the slots being in registry with one another and providing a throat to receive a bail of an article to be lifted;

a movable jaw pivotally mounted between said plates about a transverse horizontal axis, said jaw being located adjacent the lower ends of said plates at one side of the slots forming said throat, said jaw being

biased to a first position protruding into the throat and being movable to a second position fully recessed beyond said throat;

a vertically reciprocable abutment member mounted on said plates above said jaw, said abutment member being in a location bridging said throat;

motion limiting means on said aboutment means and said plates to limit the extent of downward motion of said abutment member relative to said plates;

lifting means operatively connected between said abutment member and said jaw to cause said jaw to be moved to its second position in response to predetermined upward motion of said abutment member relative to said plates;

latch means on said jaw and said plates engageable when said jaw attains its second position to selectively prevent motion of said jaw relative to said plates;

and means on said abutment member operatively engageable with said latch means to release said latch means when said abutment member is in its lowermost position relative to said plates;

said lifting means comprising a roller chain anchored at its respective ends to said plates and said jaw, said chain being entrained over a roller rotatably journalled about a fixed axis on said abutment member.

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HUGO O. SCHULZ, *Primary Examiner.*