Feb. 3, 1970 A. W. SMITH 3,493,260

SAFETY HOOK

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Fig. 1.

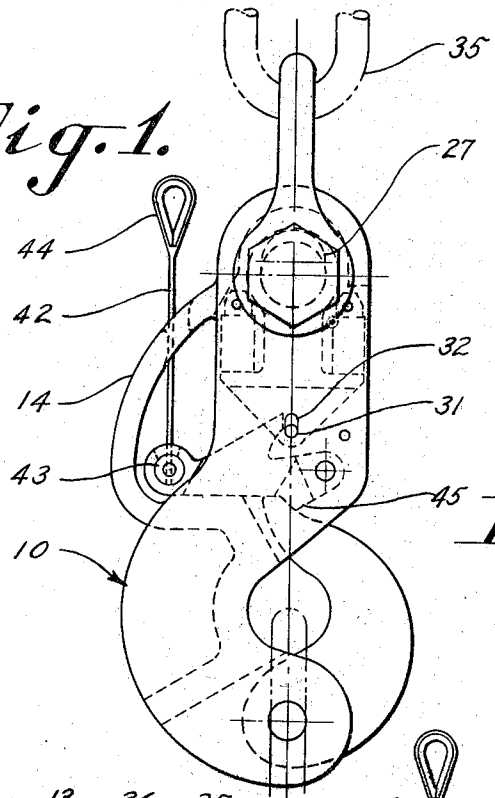
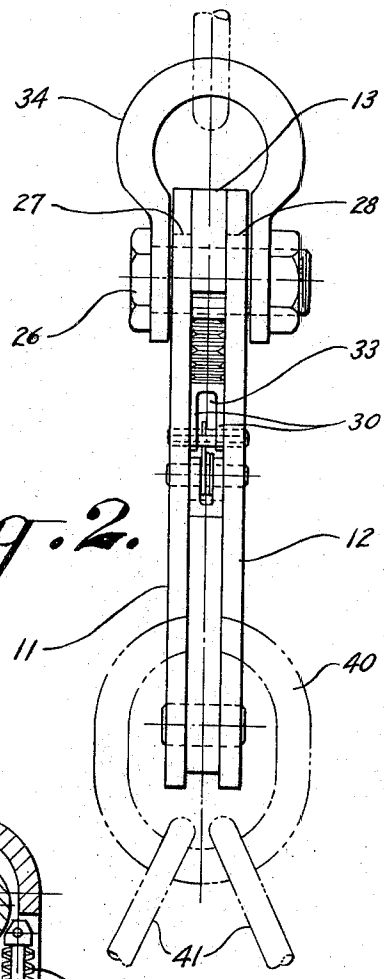


Fig. 2.



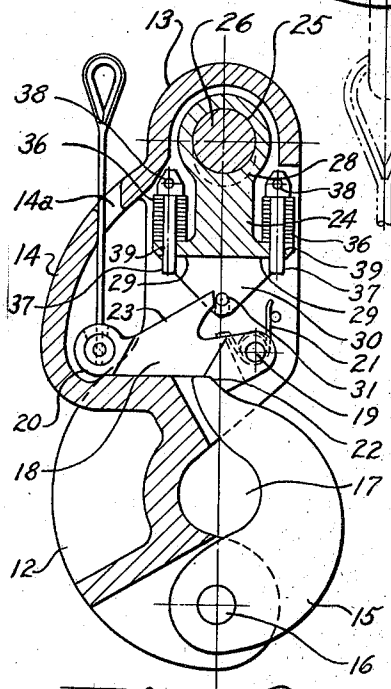


Fig. 3.

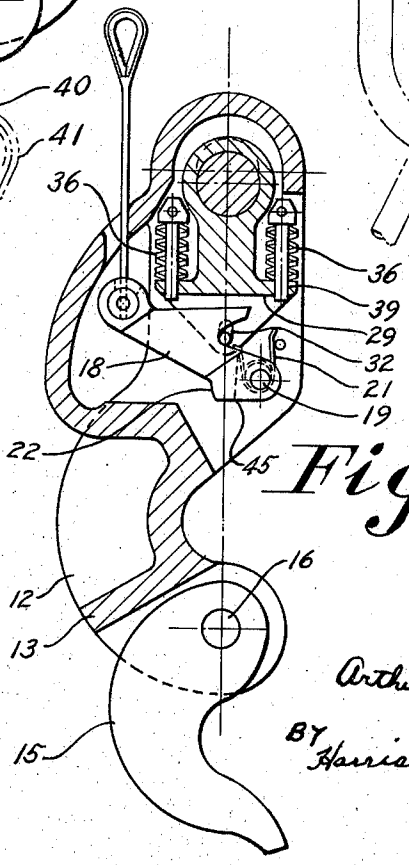


Fig. 4.

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SAFETY HOOK

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3 Claims

ABSTRACT OF THE DISCLOSURE

A safety type lifting hook having a swinging beam pivoted to a frame utilizes a manually controlled latch mechanism to retain or release the beam. When lifting a normal load a safety lock is actuated to prevent accidental unlatching. The improvement resides in the configuration and relationship of the beam latching and locking parts.

This invention relates to load engaging hooks of the type having a fixed portion and a beam portion pivoted to the fixed portion and movable to a closed retaining position.

An object of the invention is to provide an improved latch for engaging the movable beam portion and latching it in load retaining position. By locating the main latch to swing upwardly from a generally horizontal position and providing a suitably shaped cam surface with matching shaped tip on the beam portion the latching operation utilizes a minimum number of parts.

Another object is to provide improved mechanism for locking the latch when a load is being lifted by the hook. A locking element which moves upwardly under load is positioned to directly interfere with the latch structure because of a specially shaped projection on the latch. When in the unloaded or down position the lock element allows release of the latch.

A further object of the invention is to provide simplified robust locking mechanism having a main moving member controlled by a pair of Belleville spring assemblies. A balanced positioning of the Belleville spring devices provides a relatively high locking control load in a compact space.

How the foregoing and other objects and advantages of the invention are accomplished will be evident by reference to the description of the figures in which—

FIGURE 1 is a front elevational view of a lifting hook according to this invention showing the parts in closed position before lifting a load.

FIGURE 2 is a side elevational view of the hook shown in FIGURE 1.

FIGURE 3 is a sectional front view showing the hook parts in load carrying position, with certain parts omitted for clarity.

FIGURE 4 is a view similar to FIGURE 3 but showing the parts in load released position.

From the figures it will be seen that the lifting hook assembly includes a frame **10** consisting of a front plate **11** and a rear plate **12** spaced apart by a frame member **13** which extends beyond the plates **11** and **12** to form a handle **14**. The spacer frame member **13** is preferably welded or otherwise fastened to the front and rear plates to form an integral frame. At the lower end the spaced plates **11** and **12**, a beam member **15** is pivotally supported by a pivot **16** to permit swinging movement of the beam with respect to the frame **10**. The frame **10** and the beam member **15** are curved to form an aperture **17** forming the throat of the lifting hook assembly. The beam member **15** is shown in closed position in FIGURES 1 and 3 and in open position in FIGURE 4. At the upper end of the beam **15** when in

closed position a latch member **18** is movably supported by a pivot **19** between the frame plates **11** and **12**.

The latch member **18** extends beyond the frame plates so that its terminal **20** is accessible for swinging movement inside the periphery of handle **14**. A spring **21** urges the latch **18** to its engaged position as shown in FIGURES 1 and 3. A cam portion **22** of the latch **18** is shaped to engage the tip of the beam member **15** to retain it in closed position. Cam surface **22** and the engaging tip portion of beam **15** form complementary surfaces which are substantially the arc of a circle with its center at the center of pivot **19**. This configuration produces reliable retention capability for the latch with satisfactory releasing action. A projection or arm **23** attached to the latch member **18** is shaped to cooperate with a locking device in a fashion which will be described below.

The device for locking the latch in closed position when the hook is carrying a load includes a specially shaped control plate member **24** which is supported near the upper end of the frame plates **11** and **12**. Control member **24** includes a circular aperture **25** through which the shackle rod or bolt **26** extends. The plates **11** and **12** are provided with apertures **27** and **28** which are elliptical in shape to permit slight vertical motion of the shackle bolt **26**. At the lower end of the control plate member **24** there are a pair of abutments **29** and extension legs **30, 30** through which a stop element in the form of a pin **31** projects into guide slots **32** formed in the frame plates **11** and **12**. As will be seen in FIGURE 2, the extension in plate **24** includes a channel **33** formed between the legs **30, 30**. The projection **23** of the latch member **18** is proportioned so that it fits into the channel **33** between the arms **30, 30**.

The shackle bolt **26** transfers the load from frame **10** to the shackle **34** to which may be attached the lifting equipment such as illustrated by link **35** shown in broken outline. When the weight of the load to be lifted is transmitted to the shackle **34**, the bolt **26** moves upwardly in the slots **27** and **28** until it reaches the upper end. This movement of the bolt **26** carries the control plate member **24** with it. Movement of the member **24** is resisted by a pair of Belleville springs **36, 36** supported in position around eyebolts **37, 37** which are anchored with respect to the frame plates by the bolts **38, 38**. The lower ends of the eyebolts **37, 37** extend through suitable guide apertures **39, 39** in the abutments **29, 29**. The Belleville washer assemblies **36, 36** provide the desired amount of restraint so that the automatic locking action takes place when the predetermined amount of lifting action is applied.

A typical lifting sling member in the form of a sling ring **40** and sling tension members **41, 41** is illustrated in FIGURES 1 and 2 in broken outline.

A control rod member **42** is shown connected by a pivot **43** to the end **20** of the latch member **18** and extends through aperture **14***a* in the handle **14**. A loop **44** provides for the attachment of a further control (not shown) which may be used for remote operation of the release mechanism.

To load the lifting hook the beam **15** will be in open position as illustrated in FIGURE 4. The latch and locking parts will be positioned as shown in FIGURE 1. The load supporting ring **40** is placed in position in the throat **17** and the beam **15** is swung into latched position. During the final portion of the swing the tip of the beam member **15** will engage the sloping portion **45** and deflect the latch to permit the beam to swing into position when the latch returns automatically under the influence of spring **21** to the latched position shown in FIGURE 1.

The lifting hook is then in condition to lift the load

and as the lifting action increases, the shackle bolt **26** will move upwardly to the upper end of the elliptical openings **27** and **28** in the frame plates. When the load has been increased to the capacity of the springs **36**, the full upward travel of the bolt **26** will have occurred and the control member **24** will be in its upper position with the pin **31** also at the upper end of its slot **32**. Thus at loads greater than the capacity of springs **36** the pin **31** will be aligned with the end of the latch projection **23**. In this position the latch is restrained from movement in the opening direction so that accidental release cannot occur while the load is being carried. In a typical design the capacity of the springs **36** might be, for example, 5% of the normal lifting capacity of the lifting hook. Thus for a hook having a lifting capacity of 20,000 lbs., at loads above 1,000 lbs. the locking mechanism would be effective to prevent accidental unlatching. This percentage can be varied to suit the requirement of any situation, the main objective being that the springs are capable of preventing locking under the influence of tare weight such as the weight of the sling equipment being used to lift the load.

To release the load from the lifting hook it will be deposited at the delivery location and the sling tension reduced until the springs **36** move the stop and the control member downwardly to its lower position as indicated in FIGURE 1. The latch may then be swung about its pivot **19** so that the projection **23** at the latch moves past the stop pin **31** as illustrated in FIGURE 4. When the full swing has been completed the latch cam surface **22** has moved out of contact with the tip of the beam **15** and thus permits it to swing open under the influence of the weight of the sling ring **40**. The latch **18** may be moved either by direct manual application of force or by a remotely actuated pull cable which may be connected to the loop **44** of the control rod **42** to permit release of the sling when the hook is in a position not readily accessible to the operator. Alternatively an extension pole can be used for remote release operation.

From the foregoing description, it will be evident that the improved construction for a releasable lifting hook provides a robust and reliable mechanism for latching the releasable beam portion of the lifting hook and further provides a safety locking device having a minimum number of parts thus giving a simple and reliable lock mechanism.

I claim:

1. A hook device including a frame structure having a pair of spaced plates each having a lower curved portion, a load beam pivotally supported between said frame plates and having a curved shape to cooperate with the curved portion of said frame to form a load attachment throat, a load transfer bolt at the upper portion of said frame structure, a latch member pivoted at one end to said frame structure and lying in a transverse direction when in latched position, said latch member having a cam portion engageable with the end of said load beam, a spring element reacting against said latch member urging it to engaged position, the upper portion of said frame structure incorporating vertical lost motion apertures to accommodate said load transfer bolt, a lock control member supported on said bolt for movement therewith, a stop element carried by said control member, said latch member having a projecting arm at its mid portion, said arm having a terminal shape which engages said stop element when it is moved to its upward position, said projecting arm being further shaped to allow it to pass above said stop element when it is moved to its lower position.

2. The device of claim **1** in which said lock control member has a pair of abutments, each abutment having a Belleville spring assembly reacting against it to urge said control member in a downwardly direction with respect to said frame structure.

3. A load engaging hook including a frame structure having the lower portion shaped to engage a connected load member, a complementary load engaging beam part pivotally attached to the lower end of said frame structure, a latch member having a pivotal support in said frame structure and also having a cam portion for engaging the end of said load engaging part when both said load part and said latch member are in load engaged position, a load transfer member located at the upper portion of said frame structure, a cylindrical bolt member connecting said load transfer member to said frame structure, a lost motion aperture in said frame structure through which said cylindrical bolt member extends, a movable element supported in said frame structure by said bolt member, a spring device urging said element downwardly, a stop pin supported in said element and movable with it to the extent of movement permitted by said lost motion aperture, said latch member having a projecting portion shaped to swing past said stop pin when said movable element is in its downward unloaded position and to engage said stop pin when said movable element is in its upward loaded position thereby preventing movement of the latch member away from its engaged position.

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