April 9, 1963 B. RUTH 3,084,893

QUICK-RELEASE TEMPORARY ARTICULATED I-BEAM HANGER

Filed March 30, 1961

Fig. 1.

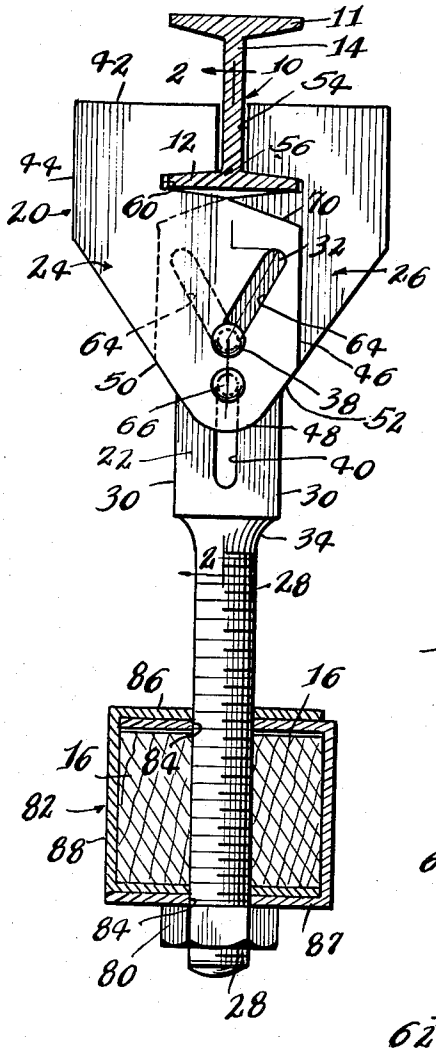


Fig. 3.

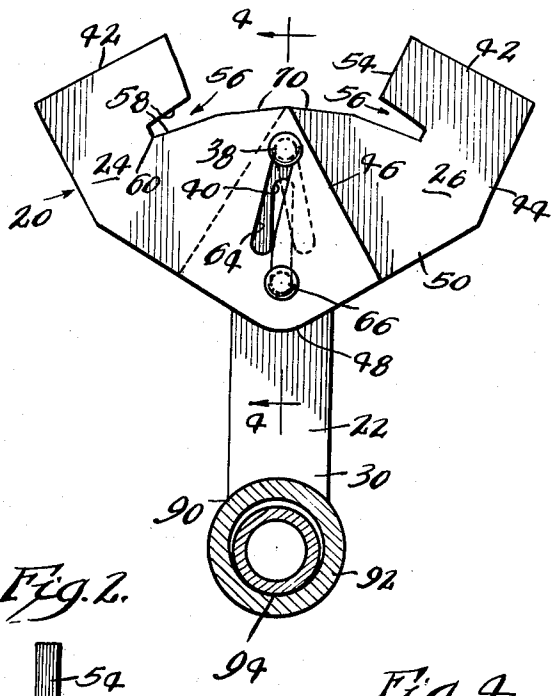


Fig. 2.

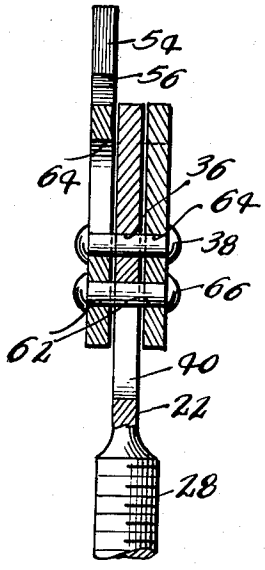
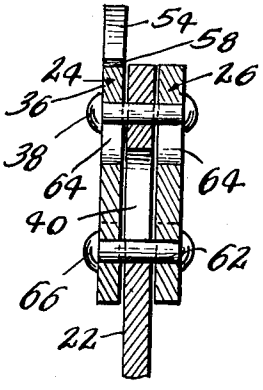


Fig. 4.



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QUICK-RELEASE TEMPORARY ARTICULATED I-BEAM HANGER

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The present invention relates to an article of concrete hardware and has particular reference to a hanger assembly which is capable of being quickly and easily applied to the base flange of an I-beam for suspending an object or objects beneath the I-beam, as well as being quickly and easily removable from the I-beam flange when its use is no longer required.

Hanger assemblies constructed in accordance with the principles of the present invention may be put to a wide variety of uses in the construction field. One of the principal contemplated uses for the present hanger assembly is in connection with a slab-forming system of the character shown and described in a copending United States patent application Serial No. 84,574, filed on January 24, 1961, and entitled "Method of and Apparatus for Erecting Concrete Building Structures Having Concrete Floor Slabs," and wherein it is frequently necessary to provide a support below the level of an I-beam on which a series of beam-supporting panels or other form devices may be positioned. The hanger of the present invention is capable of being suspended from the lower flange of an I-beam for the purpose of supporting a longitudinal stringer which may be in the form of two adjacent pieces of lumber of the 2" x 6" variety, such a stringer, in turn, serving to support the panels during concrete-pouring operations and until such time as the concrete of the beam has hardened and the panels are to be removed.

Hangers constructed according to the present invention will also find use in the suspension of pipes or other conduits in position beneath an I-beam, either as a temporary measure or as a permanent installation. Where bridges and other steel structures are provided with overhead I-beams, the present hanger assembly may be employed as a temporary support for any scaffolding that may be found necessary or expedient in the erection of the structure or in the repair or cleaning thereof. In short, the present hanger will be found useful for the suspension of a wide variety of objects on a temporary or permanent basis, wherever an I-beam having an exposed lower horizontal base flange may be found for attachment purposes.

It is among the principal objects of the present invention to provide a hanger assembly which may easily be applied to and removed from an I-beam flange by an unskilled workman without the use of tools or extraneous fastening devices and which, moreover, is capable of application to and removal from the I-beam flange utilizing only one hand to effect a hooking-on or lifting-off operation.

A further object of the invention is to provide such a hanger which is capable of sliding adjustment along the I-beam with a minimum of effort.

Another object of the invention is to provide a hanger assembly which requires for its application to the I-beam no alteration of the I-beam structure such as the drilling of holes or the like.

Yet another object of the invention is to provide a hanger assembly which is self-locking in that the greater the vertical load imposed upon it, the greater will be the locking effect.

The provision of a hanger assembly which is comprised of only three principal parts and which, therefore, may be manufactured at a low cost; one in which the parts thereof readily lend themselves to simple manufacturing processes

such as forging or stamping operations, thereby further contributing to economy of manufacture; one which is extremely simple in its construction as well as being rugged and durable so that the same is unlikely to get out of order; one in which two of the three principal parts thereof are identical in design; and one which otherwise is well-adapted to perform the services required of it, are further desirable features which have been borne in mind in the production and development of the present invention.

With these and other objects in view, the invention consists in the novel construction, combination and arrangement of parts shown in the accompanying single sheet of drawing forming a part of this specification.

In this drawing:

FIG. 1 is a side elevational view of a hanger assembly constructed according to the principles of the present invention and showing the same operatively applied to the base flange of an overhead I-beam for suspension therebeneath of a pair of wooden supports;

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1 and in the direction indicated by the arrows;

FIG. 3 is a side elevational view similar to FIG. 1 but showing the hanger assembly in its position of release and, for illustrative purposes, showing the same adapted for use in supporting a tubular conduit; and

FIG. 4 is a sectional view taken on the line 4—4 of FIG. 3.

Referring now to the drawings in detail, an I-beam has been illustrated in FIG. 1 and designated in its entirety by the reference numeral 10. The I-beam is provided with the usual upper horizontal flange 11, a lower or base flange 12, and a connecting web 14. It may be assumed that the I-beam is an overhead I-beam associated with a concrete form installation for the production of a monolithic beam and slab combination as shown and described in the aforementioned patent application and that the hanger assembly of the present invention is employed for suspending a pair of 2" x 6" pieces 16 of lumber such as have been shown beneath the I-beam for panel-supporting purposes so that the concrete may be poured upon the panels.

The hanger assembly of FIG. 1 is designated in its entirety by the reference numeral 20 and involves in its general organization three principal parts, namely, a hanger plate 22, and two flange-engaging hook plates 24 and 26. The hanger plate 22 may be formed as an integral part of a suspension rod 28 at the upper end of the latter by flattening the rod at this end, or it may be an individual plate to which an article to be suspended from the I-beam may be affixed, as, for example, by welding. The same plate 22 appears in FIG. 3, but the rod portion thereof has been severed therefrom for purposes that will be described hereafter.

The hanger plate 22 is of elongated design and of generally rectangular configuration. It is provided with parallel vertical side edges 30, a horizontal top edge 32, and a lower edge 34. The lower edge of the plate merges with the suspension rod 28 in the disclosure of FIG. 1. The plate 22 is further provided with a hole 36 for loosely receiving therethrough a stop and guide pin 38. Spaced below the hole 36 and in vertical alignment therewith is an elongated guide slot 40.

The two hook plates 24 and 26 are identical in configuration and, therefore a description of one of these plates will suffice for the other. Each plate is in the form of a flat member having a top edge 42, a pair of side edges 44 and 46, and a rounded bottom edge 48. The lower regions of the side edges 44 and 46 are inclined inwardly and downwardly as indicated at 50 and 52, respectively. The upper region of the side edge 46 is provided with an inwardly offset portion 54 and the region

of juncture between the side edge and its offset portion 54 is formed with an inwardly directed notch 56. The side walls 58 of the notch 56 taper outwardly from the bottom 60 of the notch for flange clearance purposes, as will be described subsequently.

Each hook plate 24 or 26, as the case may be, has formed therein a hole 62 in the lower region thereof and immediately above the hole 62 the plate has formed therein an inclined elongated slot 64. In the assembled hanger, the two plates 24 and 26 are oppositely disposed so that the slot 64 in the plate 24 is inclined upwardly and to the right as viewed in FIG. 1, while the slot 64 in the plate 26 is inclined upwardly and to the left as seen in dotted lines in this view. The holes 62 in the plates 24 and 26 receive therethrough a combined pivot and guide pin 66, the pin projecting through the slot 40 in the hanger plate 22 and being vertically slidable therein. The pin 66 serves pivotally to connect the lower edge regions of the two hook plates 24 and 26 together and to guide these lower regions for movement collectively in unison in a vertical path during vertical sliding movement of the pin 66 in the slot 40. Stated in other words, the pin 66 serves to carry the lower regions of the two hook plates 24 and 26 bodily upwardly and downwardly during opening and closing movements of the two hook plates 24 and 26 relatively to each other for flange-engaging and flange-releasing purposes as will be described presently.

The previously mentioned guide pin 38 which projects through the hole 36 in the hanger plate 22 also projects through both slots 64 and is slidable therein during opening and closing movements of the hook plates 24 and 26. This pin 38, as well as the combined pivot and guide pin 66, may assume the form of a rivet or it may be a nut and bolt assembly or the like. Irrespective, however, of such details, the essential features of the present invention are at all times preserved.

In the operation of the hanger assembly, the same may be applied to the lower or base flange 12 of the I-beam 10 simply by grasping the rod 28 or plate 22 in one hand and holding the entire assembly vertically so that the weight of the various parts, including the two hook plates 24 and 26, will cause these plates to swing to their open or spread-apart condition under the influence of gravity, considering the looseness of the parts which are in no way bound by the pivot and guide pins 38 and 66. The upper edges of the slots 64 will exert a camming action on the pin 38 while the pin 66 will constrain the lower regions of the two plates to move vertically downwardly and cause both plates to tilt outwardly and away from each other to increase the distance between the two substantially opposed edges 54 of the plates and create an entrance opening sufficiently wide to permit the base flange 12 of the I-beam to become aligned laterally with the two notches 56 of the hanger assembly as a whole, in the thus spread-apart condition of the plates 24 and 26, are moved upwardly beneath the I-beam and into operative register with the flange 12 of the latter.

With the flange 12 of the I-beam 10 thus in approximate lateral alignment with the two oppositely facing opposed notches 56, either one of these notches may be hooked over one side of the flange 12 a slight distance and the lifting force on the rod 28 or hanger plate 22 relieved so as to lower the plate. During such lowering of the hanger plate 22, the particular hook plate 24 or 26 which is in engagement with the I-beam flange 12 will be swung upwardly and inwardly toward the other hook plate and the latter hook plate will be constrained to also be swung upwardly and inwardly by virtue of the upward thrust of the pin 66 which will cause the lower edge of the slot 64 to exert a camming effect on the pin 38 to force the plate to swing about the horizontal axis of the pin 66. During such camming action, the pin 66 may rotate freely in the manner of a roller to enhance the anti-frictional characteristics of the moving parts and inhibit binding thereof. As the hanger plate 22 continues to be lowered, the two jaw-like parts of the hook plates 24 and 26 will close upon the I-beam flange 12 and the latter will enter the opposed notches 56 while the upper edges 58 of these notches will move into position immediately above the upper surfaces of the flange 12 on opposite sides of the I-beam web 14.

It is to be noted that at this point the opposite upper and lower faces of a conventional I-beam base flange, such as the flange 12, are tapered or inclined outwardly toward each other. Accordingly, the two notches 56 in the plates 24 and 26 are similarly tapered so that their side edges 58 slope away from each other at an angle slightly greater than the angle of taper of the flange surfaces. There is, thus, ample clearance for the I-beam flange 12 within the slots 56. It also is to be noted that when the hook plates 24 and 26 are closed upon the I-beam flange 12, the lower edges 58 of the slots 56 are inclined inwardly and downwardly away from the bottom face of the I-beam. When the hook plates 24 and 26 are in their open position or position of release, the portions 70 of the edges of the plates which extend between the edges 46 and the bottom edges 58 of the notches 56 extend substantially horizontally, these two edges 58 directly underlying the I-beam flange 12. In the closed condition of the plates 24 and 26, the inclination of these edges 58 is appreciably steeper than is the inclination of the bottom edges 58 of the notches. These edges 58 thus constitute relief or clearance surfaces so that the notches 56 may engage over the lateral edges of the I-beam flange 12 without difficulty or interference.

Upon release of the hanger assembly 20, the assembly will remain suspended from the I-beam with the weight of the assembly and any article which may be supported thereby being borne by the upper edges 58 of the two notches 56. The jaws are self-closing or self-locking under the influence of the downward pull which is exerted upon the hanger plate 22 so that there will be no danger of inadvertent release of the I-beam by the assembly, even when the rod 28 or an object supported thereby is subjected to inadvertent impact forces in a lateral direction. The length of the two slots 64 and the disposition of their extreme upper ends determine the extent to which the two plates 24 and 26 may be closed upon each other. Preferably, the parts are designed according to engineering expediencies so that when the pin 38 is in contact with the lower ends of the slots 64, the two opposed edges 54 will be separated from each other a distance slightly greater than the thickness of the web 14 of the I-beam 10. Therefore, no tong action is exerted upon the I-beam and the suspension of the assembly 20 from the I-beam does not depend upon a gripping force. It depends upon an almost complete encompassing of the I-beam flange by the side edges of the two notches 56.

Release of the I-beam by the assembly 20 for removal purposes is effected as readily as is the application of the assembly to the I-beam. It is merely necessary for the operator to grasp the rod 28 or plate 22 and relieve the tensional forces existing upon the same by lifting the plate upwardly to relieve the pressure between the upper edges 58 of the notches 56 and the upper surfaces of the I-beam flange 12. The plates 24 and 26 will immediately move toward their open condition as illustrated in FIG. 3 under the influence of gravitational forces acting thereon, and the opposed edges 54 of these plates will move apart a distance sufficiently great that they will clear the longitudinal edges of the I-beam flange 12, whereupon the assembly may be lowered away from the flange.

The hanger plate 30 may be employed for supporting various articles. For exemplary purposes, in FIG. 1 the suspension rod 28 is shown as being threaded throughout a major portion of its length and the lower end of the rod receives thereon a suspension nut 80. An open-ended tubular box-like suspension cage 82 is provided with openings 84 in the top and bottom walls 86 thereof so that this cage may be threaded on the rod 28 for vertical

sliding movement therealong. The previously mentioned lumber pieces **16** are passed longitudinally through the cage **82** and are confined respectively between the rod **28** and vertical side walls **88** of the cage. The cage **82** is supported on the suspension nut **80** and its elevation along the rod **28** may thus be adjusted.

In FIG. 3, the plate **22** has its lower edge welded as at **90** to a tubular open-ended sleeve-like support **92** which may be employed for maintaining an elongated object such as a conduit **94** or other similar member, such as a rod, in position beneath the I-beam. The conduit **94** is passed through the support and rests upon the lower region thereof. Various other types of supporting structures may be associated with the hanger plate **22** and are contemplated by the present invention.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawing or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit of the invention. Therefore, only insofar as the invention has particularly been pointed out in the accompanying claims is the same to be limited.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. In a hanger assembly for suspending an article from the base flange of a horizontally disposed I-beam or the like, in combination, a flat suspension plate provided with an elongated vertically extending slot therein, a combined pivot and guide pin projecting horizontally through and slidable in said slot, a pair of flat hook plates disposed on opposite sides of said suspension plate in substantial face-to-face contiguity therewith and having their lower regions connected to the pin for relative swinging movement of the plates in opposite directions respectively about the axis of the pin during vertical movement of the latter, interengaging means on each hook plate and the suspension plate constraining the upper ends of the hook plates to swing outwardly away from the vertical central axis of the suspension plate and about the horizontal axis of the pin toward an inoperative position wherein the axes thereof are divergent as the pin moves upwardly in said slot, and inwardly toward said axis and toward an inoperative position wherein said axes are vertical and substantially parallel to each other as the pin moves downwardly in the slot, each hook plate being formed with a hook portion thereon adapted to overlie the base flange on opposite sides of the I-beam web when the hook plates are in their operative position, said interengaging means

comprising a pin projecting through said suspension plate and extending outwardly therefrom on opposite sides thereof, each of said hook plates being formed with an elongated slot therein into which said latter pin projects.

2. In a hanger assembly for suspending an article from the base flange of a horizontally disposed I-beam or the like, a flat suspension plate provided with an elongated vertically extending slot therein, a combined pivot and guide pin projecting horizontally through and slidable in said slot, a pair of flat hook plates disposed on opposite sides of said suspension plate in substantial face-to-face contiguity therewith and having their lower regions connected to the pin for relative swinging movement of the plates in opposite directions respectively about the axis of the pin during vertical movement of the latter, interengaging means on each hook plate and the suspension plate constraining the upper ends of the hook plates to swing outwardly away from the vertical central axis of the suspension plate and about the horizontal axis of the pin toward an inoperative position wherein the axes thereof are divergent as the pin moves upwardly in said slot, and inwardly toward said axis and toward an inoperative position wherein said axes are vertical and substantially parallel to each other as the pin moves downwardly in the slot, each hook plate being formed with a hook portion thereon adapted to overlie the base flange on opposite sides of the I-beam web when the hook plates are in their operative position, said interengaging means comprising a pin projecting laterally through said suspension plate in axially fixed relationship and freely rotatable about its own axis, and a slot in each hook plate into which the pin projects.

3. In a hanger assembly, the combination set forth in claim 2 and wherein the pin which projects through the suspension plate is disposed above the level of the upper end of the slot in said suspension plate and is in vertical alignment with such slot.

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