United States Patent

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[54] **OVERLOAD-PREVENTING HANDLES**
8 Claims, 6 Drawing Figs.

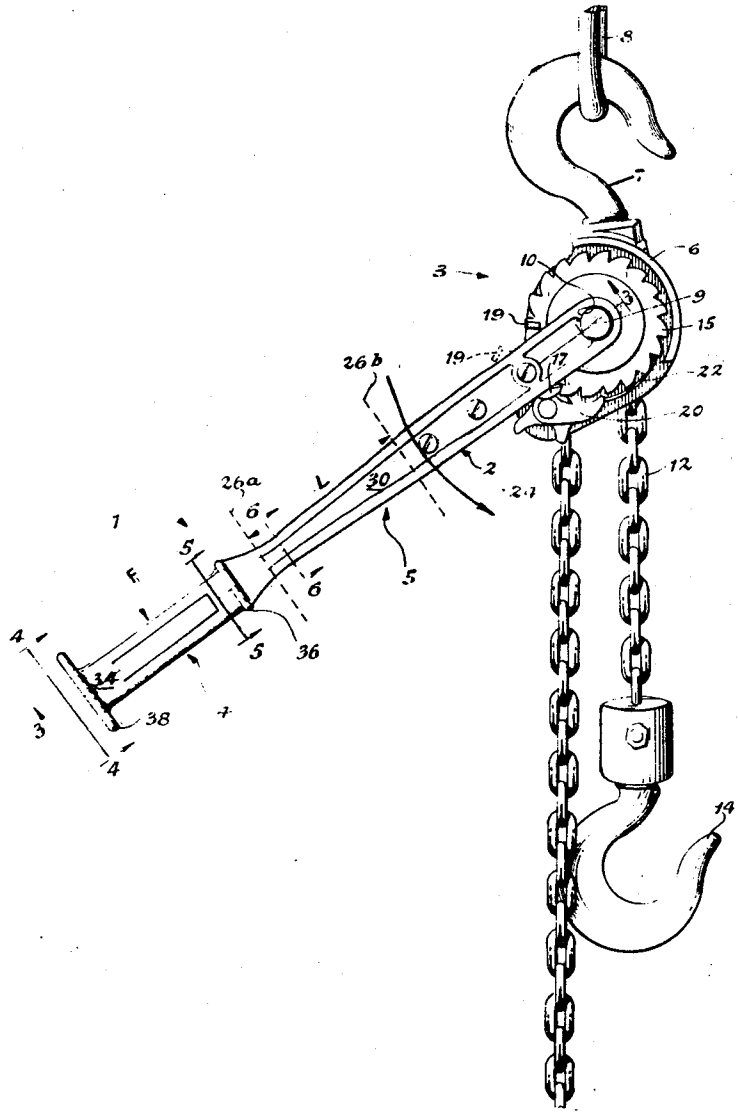
[52] **U.S. Cl.** **74/523,** 254/167
[51] **Int. Cl.** **G05g 1/04**
[50] **Field of Search** 74/523, 545, 543, 519; 254/142, 167

[56] **References Cited**
UNITED STATES PATENTS

1,243,614	10/1917	Levalley	74/523
2,243,361	5/1941	Stahl	254/167

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Assistant Examiner—F. D. Shoemaker
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ABSTRACT: A handle of the type adapted to prevent overloading of a mechanism with which it is operably associated, wherein a significant length of the handle is designed such that all points lengthwise thereof will simultaneously experience the same bending stress when a mechanism-operating load is applied to the handle, thereby resulting in a noticeably bending deformation of the length of handle before failure of the handle.



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Fig. 1.

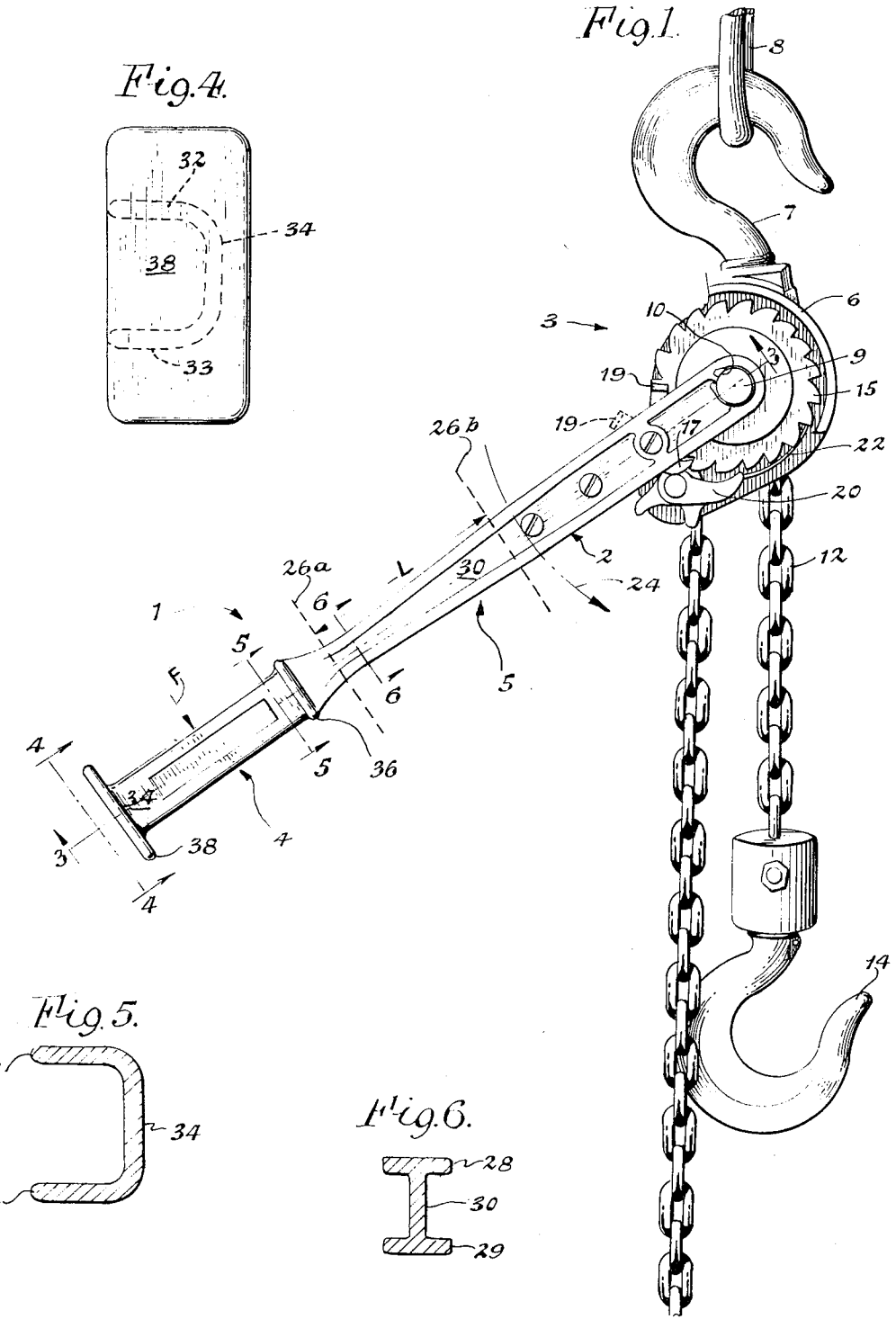


Fig. 4.

Fig. 5.

Fig. 6.

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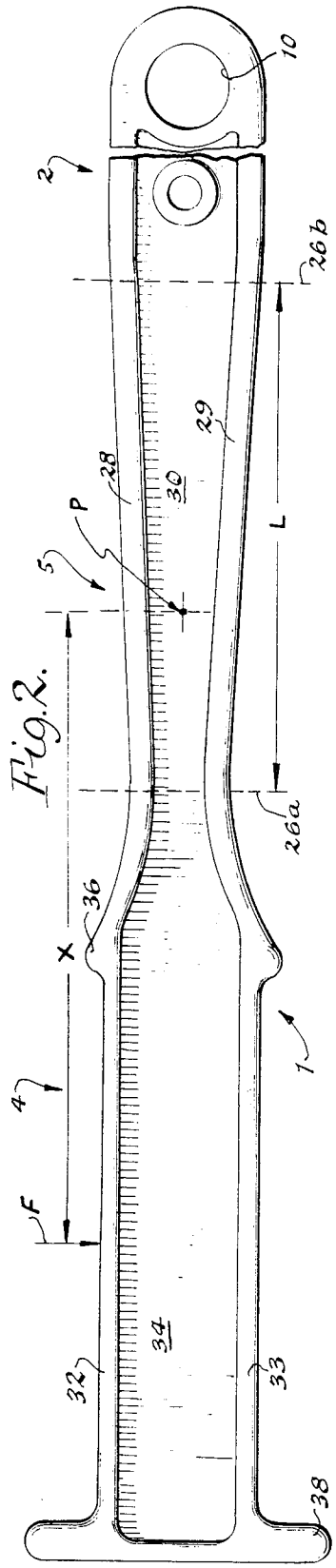


Fig. 2.

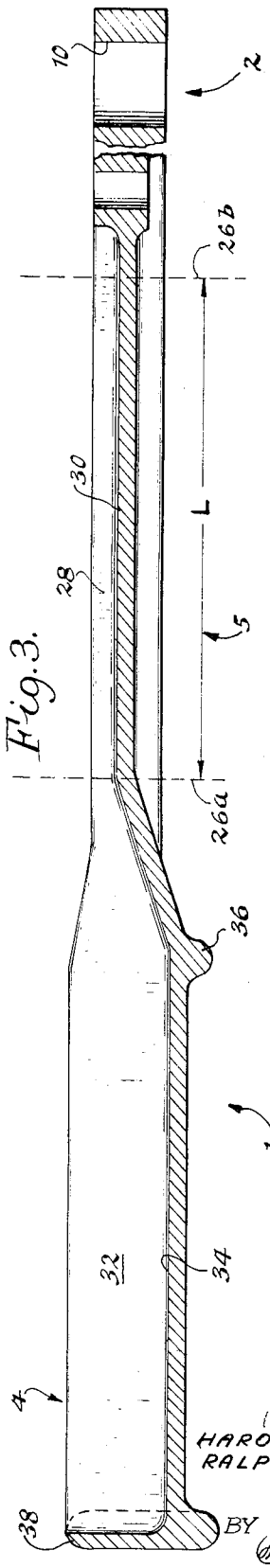


Fig. 3.

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OVERLOAD-PREVENTING HANDLES

BACKGROUND OF THE INVENTION

It is common practice to provide handles, which are designed to fail under a given applied loading below that which would result in damage to a mechanism with which they are operably associated.

Prior handle constructions of this type include tubular handles whose walls are made sufficiently thin to fail by bending under a predetermined loading condition. One drawback of tubular handles is that they normally fail by bending at the point at which they are fixed to the mechanism with the result that it is ofttimes difficult to remove the bent handle for replacement purposes.

This drawback has been overcome in cast or stamped metal handle constructions by providing an aperture or notch in the handle, so as to define a weakened area at which bending stress is to be maximized, which is spaced from the point of handle attachment.

However, in all previous overload-preventing handle constructions of which I am aware, bending is ofttimes accompanied by fracture or breaking of the handle due to the fact that an operator does not notice the initiation of bending until it is too late to relieve the overloading condition. Moreover, even in cases where a handle formed in accordance with prior practice does not completely fail, it is ofttimes too weak to permit any further operation thereof. This is a particularly serious drawback in situations where operation of the deformed handle is required to release or return a mechanism, such as a ratchet puller, to a nonoverload condition.

SUMMARY OF THE INVENTION

The present invention generally relates to handles adapted to prevent overloading of a mechanism which they serve to operate by undergoing bending deformation when a predetermined load is applied to the handles by an operator.

More particularly, the present invention is directed towards a handle wherein an elongated portion of the handle intermediate the mounting and operating ends thereof is designed such that all points in a direction lengthwise thereof simultaneously experience the same bending stress when a mechanism operating load is applied. As a result, when a predetermined operating load is applied to the handle, the intermediate portion of the handle bends in a uniform manner. In that bending simultaneously occurs over a significant length of the handle, the cumulative bending deformation of the handle is pronounced at the initiation of the overload condition, so as to quickly and dramatically bring to the attention of an operator the fact that an excessive load has been applied. This permits the operator to remove the predetermined operating load while the handle, although significantly deformed, retains sufficient strength to permit its operation for the purpose of releasing or returning the mechanism with which it is associated to a nonoverloaded condition.

Uniform bending stress is produced in the intermediate portion of the handle by progressively decreasing the section modulus thereof in a direction towards the operating portion of the handle. In accordance with the preferred embodiment of the present invention, the intermediate portion of the handle is of I-shaped cross-sectional configuration and the section modulus decreased by varying the height of a web connecting a pair of spaced flanges.

In a preferred construction the handle is in the form of a metal casting, wherein the web and flanges of the intermediate portion extend into the operating end portion, so as to provide a C-shaped handle grip, which may be conventionally grasped by the hand of an operator. The web and flanges defining the handle grip are formed adjacent opposite ends thereof with integrally formed reinforcing enlargements, which serve to positively position an operator's hand during operation of the handle, and/or prevent a lever arm, such as a pipe, from being applied to the hand grip.

DRAWINGS

The nature and mode of operation of the present invention will be more fully described in the following detailed description taken with the accompanying drawings wherein:

FIG. 1 is a front elevational view of the handle of the present invention, showing it mounted on a ratchet-type puller;

FIG. 2 is a rear elevational view of the handle shown in FIG. 1;

FIG. 3 is a sectional view taken generally along the line 3–3 in FIG. 1;

FIG. 4 is an end view of the handle with reference being made to line 4–4 in FIG. 1;

FIG. 5 is a sectional view taken generally along the line 5–5 in FIG. 1; and

FIG. 6 is a sectional view taken generally along the line 6–6 in FIG. 1.

DETAILED DESCRIPTION

The handle of the present invention, which is generally designated as 1 in the drawings, is preferably in the form of an integrally metal casting having an end portion 2 for mounting the handle on a mechanism to be operated, such as a ratchet puller 3; an operating end portion 4 to which a mechanism-operating load is to be applied by an operator; and an intermediate or connecting portion 5.

Puller 3 is shown in FIG. 1 for purposes of reference only as including a frame 6, which is provided with a hook 7 for suspending the frame from a suitable support 8. Handle 1 is mounted for vertical swinging movement relative to frame 6 by means of a shaft 9 freely received within mounting end portion aperture 10. Shaft 9 additionally serves to rotatably support a lift wheel, not shown, which operably engages a lift chain 12 having a load-lifting hook 14; and a ratchet wheel 15, which is affixed for rotation with the lift wheel.

A suitable ratchet-wheel-operating device, as for instance of the type shown and described in U.S. Pat. No. 2,633,328, is employed to operably interconnect handle 1 to ratchet wheel 15 for the purpose of controlling oppositely directed rotations thereof, which result in either raising or lowering of load-lifting hook 14. For purposes of reference, the ratchet-wheel-operating device is shown in FIG. 1 as including in part a ratchet-wheel-actuating pawl 17 and a reversing lever 19, which are carried by handle 1, and a ratchet-wheel-locking pawl 20 and a locking-pawl-biasing spring 22, which are carried by frame 6. When it is desired to raise load-lifting hook 14, an operator places lever 19 in its phantom line position shown in FIG. 1, and after gripping operating end portion 4 applies a force or load F to swing handle 1 downwardly in a direction indicated by arrow 24. During such movement, ratchet wheel 15 is rotated by actuating pawl 17 and locking pawl 20 merely serves to retain the ratchet wheel in the rotatable position into which it is driven by the actuating pawl. When it is desired to lower lifting hook 14, an operator places lever 19 in its full line position shown in FIG. 1 and momentarily pulls down on handle 1 for the purpose of rotating ratchet wheel 15 sufficiently to release locking pawl 20 from engagement therewith; the weight applied to lifting hook 14 thereafter acting through the ratchet wheel and actuating pawl 17 to pivot the handle upwardly until the locking pawl is reengaged. Thus, it will be apparent that in operation of puller 3 it is necessary to apply an operating load to handle 1 both during the raising and lowering or release of an overload handled by the puller.

As is conventional, handle intermediate portion 5 is designed such that it is weaker than end portions 2 and 4 in order that it will be overstressed first when a predetermined operating load is applied to operating end portion 4 above which puller 3 would be subjected to an overloaded condition. Thus, failure of intermediate portion 5 by bending will protect puller 3 from being overloaded and once subjected to bending failure it will be replaced by a new handle.

It is a particular feature of the present invention that intermediate portion 5 is configured such that bending stress produced therein, as a result of a mechanism-operating force or load F applied to end portion 4, is substantially constant along a significant length of the intermediate portion, as for instance the length L between heavy dashed lines 26*a*, 26*b*, shown in FIGS. 1—3. As a result, each point along length L will simultaneously undergo bending deformation at the initiation of the application of the predetermined operating load, so as to produce a cumulative bending deformation of the handle, which immediately and dramatically brings the initiation of an overload condition to the attention of an operator. With this warning, the operator has sufficient opportunity to remove the operating load before any individual point along length L has been bent or overstressed to the point which would result in complete failure of the handle or weakening thereof to such an extent that it cannot be operated to lower or release an overload handled by the puller.

Bending stress at any given point along length L, as for instance point P shown in FIG. 2, may be defined as being equal to M/Z, wherein M is a Moment which may be defined as load F multiplied by the Moment arm or Distance X through which the load acts, and Z is the section modulus of the handle at point P. Thus, it will be apparent that for any given load F, the section modulus Z must be progressively decreased along length L towards operating end portion 4 in order for uniform bending stress to be maintained at each point along length L.

By referring to FIGS. 1—3 and 6, it will be seen that in accordance with the preferred embodiment of the present invention, intermediate portion 5 is formed with a generally I-shaped cross-sectional configuration and defined by an upper flange 28, a lower flange 29 and an intermediate or connecting web 30. When employing this construction, the section modulus is preferably varied along length L by progressively decreasing the height of web 30 in a direction towards operating end portion 4.

Another feature of the present invention is to form operating end portion 4 with a generally C-shaped cross-sectional configuration, which as best shown in FIGS. 2, 4 and 5 is defined by an upper flange 32, a lower flange 33 and an intermediate or connecting web 34. To both facilitate the casting of handle 1 and produce a relatively strong, light weight structure, flanges 32, 33 and web 34 are connected to or formed as continuations of flanges 28, 29 and web 30, respectively. Flanges 32, 33 and web 34 cooperate to provide an enlarged handle grip, which may be conveniently grasped by an operator for the purpose of applying an operating load.

Formed integrally with opposite ends of flanges 32, 33 and web 34 are transversely extending enlargements in the form of a bead 36 and end flange 38, which bound the handle grip and cooperate to prevent slippage of an operator's hand therefrom.

Preferably, end flange 38 is arranged and dimensioned so as to prevent the placing of an additional lever arm, such as a length of iron pipe, either about or between flanges 32, 33 for the purpose of increasing the moment which may be applied to puller 3. Otherwise, the possibility would exist that the length of pipe would be slid onto handle 1 sufficiently far so as to cover intermediate portion 5 with the result that the puller could be damaged by overloading thereof even though provided with a handle according to the present invention.

While only the preferred embodiment of the handle of the present invention has been described in detail, it will be understood that alternative constructions may be adopted without departing from the practice of the invention. In this respect, the handle may be formed by means other than casting and the parts thereof have any desired cross-sectional configuration. Further, handles formed in accordance with the present invention may be employed to operate diverse mechanisms.

We claim:

1. A handle for preventing overloading of mechanism operated by the handle by undergoing bending deformation when a predetermined mechanism-operating load is applied thereto, said handle comprising:

an end portion for mounting said handle on said mechanism;

an operating end portion to which mechanism-operating loads are to be applied; and

an intermediate portion connecting said end portions, said intermediate portion being elongated in a direction lengthwise of said handle and being characterized by a configuration wherein section modulus progressively decreases in a direction towards said operating end portion such that bending stress produced in said intermediate portion as a result of a mechanism operating load applied to said operating end portion is substantially constant at all points lengthwise thereof, said bending stress in said intermediate portion for all operating loads being greater than in said end portions, whereby when said predetermined operating load is applied to said operating end portion bending deformation of said handle occurs only in said intermediate portion and bending deformation of said intermediate portion occurs substantially simultaneously at all points lengthwise thereof.

2. A handle according to claim 1, wherein said handle portions are of integrally formed construction.

3. A handle according to claim 1, wherein said intermediate portion is of I-shaped cross-sectional configuration defined by a pair of spaced flange portions and a connecting web portion.

4. A handle according to claim 3, wherein said section modulus is decreased by decreasing the height of said connecting web portion in a direction towards said operating end portion.

5. A handle according to claim 3, wherein at least said operating end and intermediate portions are of integrally formed construction, said operating end portion is of C-shaped configuration defined by a pair of spaced flange portions and a connecting web portion, and said flange and web portions of said operating end portion being formed continuous with said flange and web portions of said intermediate portion.

6. A handle according to claim 5, wherein said operating end portion is enlarged adjacent opposite ends thereof in a direction transversely of said handle.

7. A handle according to claim 3, wherein said operating end portion is of C-shaped cross-sectional configuration defined by a pair of spaced flange portions and a connecting web portion, said flange and connecting web portions of said operating end portion being connected adjacent one end thereof to said flange and web portions of said intermediate portion and being connected adjacent another end thereof to a flange extending outwardly thereof in a direction transversely of said handle.

8. A handle according to claim 1, wherein said handle portions are in the form of an integral metal casting;

said intermediate portion is of I-shaped cross-sectional configuration having upper and lower flange portions and a connecting web portion, said operating end portion is of C-shaped cross-sectional configuration having upper and lower flange portions and a connecting web portion, said flange and web portions of said operating end portion being joined adjacent one end thereof with said flange and web portions of said intermediate portion,

said flange and web portions of said operating end portion being provided adjacent said one end thereof and adjacent another end thereof with flange means extending outwardly thereof in a direction transversely of said handle.