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Hawkins et al.

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[54] **OVERLOAD PREVENTION HANDLE**

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[52] **U.S. Cl.** .....**74/524,** 81/52.4 R

[51] **Int. Cl.** **G05g 1/06**

[58] **Field of Search**.....74/524, 525, 523; 81/52.4 R

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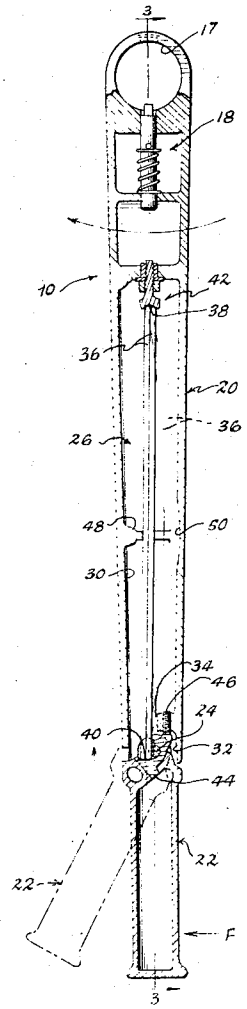
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[57] **ABSTRACT**

A handle particularly adapted to prevent overloading of chain hoists operated thereby. The handle is characterized as having an operator grasping extension portion pivotally supported on the main body portion of the handle and a constraining device operable to permit movement of the extension portion relative to the main body portion whenever a hoist overload condition producing operating force is applied to the extension portion.

13 Claims, 6 Drawing Figures



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SHEET 1 OF 2

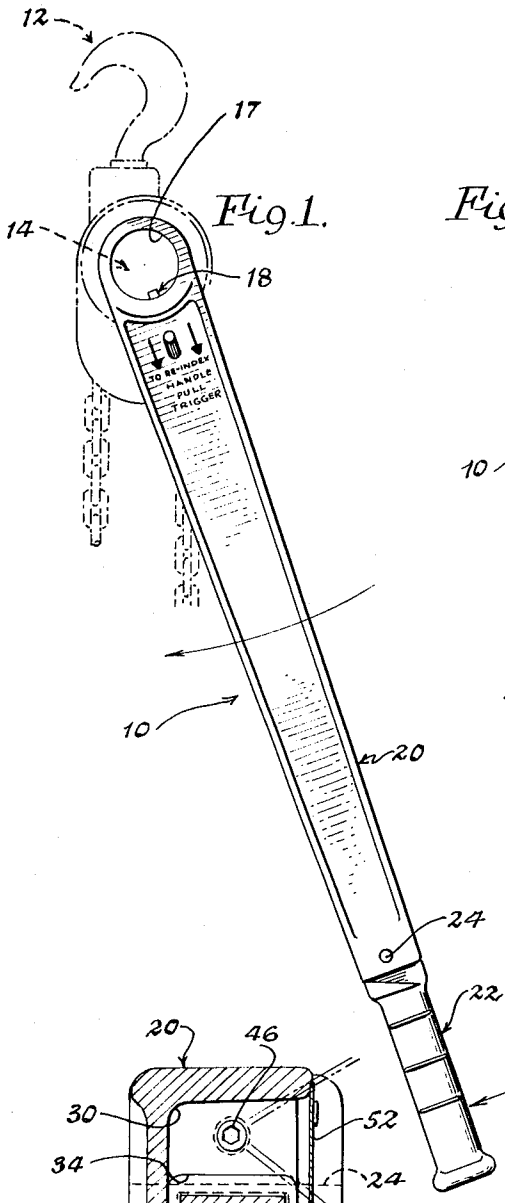


Fig. 1.

Fig. 4.

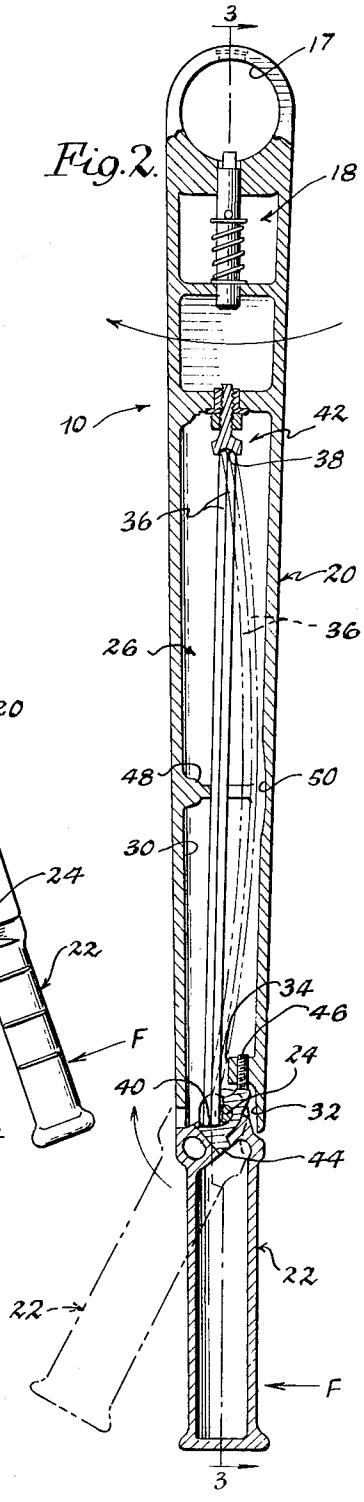


Fig. 2.

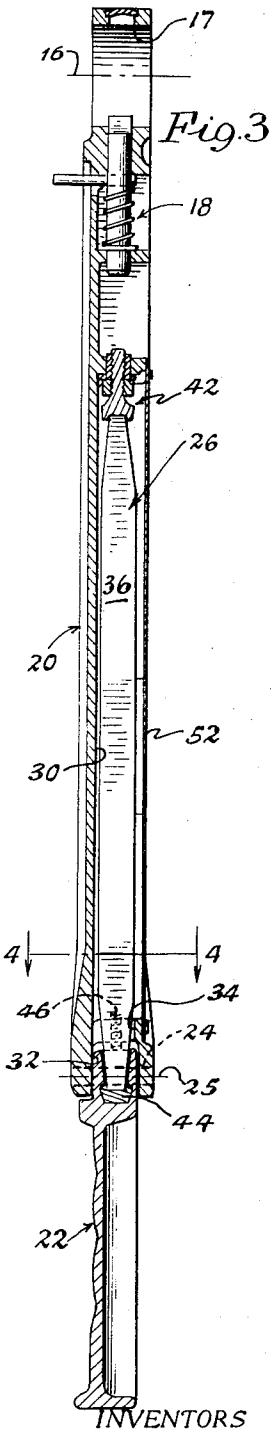


Fig. 3

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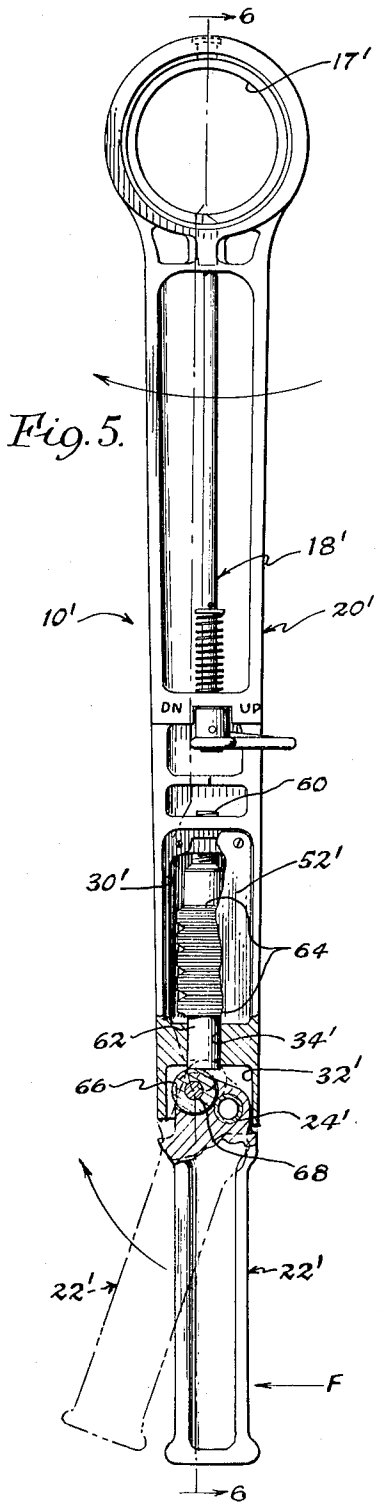


Fig. 5.

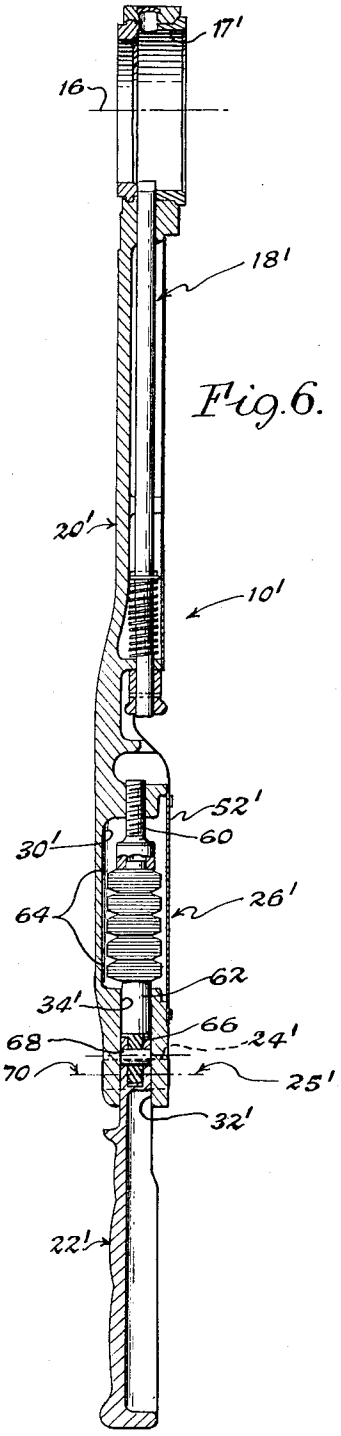


Fig. 6.

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OVERLOAD PREVENTION HANDLE

SUMMARY OF THE INVENTION

The present invention relates to overload prevention handles, and more particularly to handles having utility in preventing overloading of chain hoists actuated thereby.

The present handle construction is characterized as including an extension portion pivotally supported on a main body portion of the handle, which is in turn suitably connected to the hoist mechanism to be operated. Pivotal movement of the extension portion relative to the main body portion is normally prevented by a constraining device. However, when an operator applies a predetermined operating force slightly below that which would produce an overload condition in the hoist, the constraining device permits pivotal movement of the extension portion relative to the body portion. This relative movement provides a visual indication that an overload condition is about to be encountered and is effective in preventing further operating movement of the handle.

In one form of the present invention, the constraining device is in the form of an eccentrically loaded column, which is subject to "elastic" buckling thereby to permit pivotal movement of the extension portion relative to the body portion upon application of a maximum predetermined hoist operating force.

In another form of the present invention, the constraining device includes a stack of Belleville type spring discs or washers.

In both forms of the present invention, the constraining device may be adjustably pre-loaded in order to accurately establish the maximum predetermined operating force, which may be applied to the handle extension, and will serve to return the extension portion to its initial or normal operating position after the predetermined operating force is removed.

DRAWINGS

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

FIG. **1** is a side view of a preferred embodiment of the overload prevention handle of the present invention showing it mounted on a chain hoist to be operated thereby;

FIG. **2** is a sectionalized view of the handle shown in FIG. **1**;

FIG. **3** is a sectional view taken generally along line **3—3** in FIG. **2**;

FIG. **4** is a sectional view taken generally along line **4—4** in FIG. **3**;

FIG. **5** is a view illustrating an alternative form of the present invention with parts broken away for purposes of clarity; and

FIG. **6** is a sectional view taken generally along line **6—6** in FIG. **5**.

DETAILED DESCRIPTION

To facilitate understanding of the overload prevention handle of the present invention, which is generally designated as **10** in the drawings, particular reference will be made to its use for operating a hoist **12**, which is shown in phantom line only in FIG. **1**. Hoist **12** may be of any conventional construction, such as for instance a chain hoist of the type having a hub portion **14** adapted to mount handle **10** for hoist operating movements about an operating axis designated as **16** in FIG. **3**. Depending upon the construction of hoist **12**, any suitable means may be employed to drivingly interconnect handle **10** with hub portion **14**, such as a hub portion receiving recess **17** and an associated indexing pawl mechanism **18**, the latter being removably receivable within cooperating hub portion recesses, not shown. It will be understood that the specific construction of hoist **12** and the drive arrangement for interconnecting handle **10** therewith is conventional and forms no part of the present invention. Moreover, it will be appreciated that, while the present handle has particular utility in preventing the overloading of hoists, it may with slight modification to the mounting arrangement be used as a torque-limiting handle or wrench.

More specifically, handle **10** includes a main body portion **20**, which is formed adjacent one end thereof with opening **17** and serves to mount pawl mechanism **18**; an extension or operator hand grip portion **22**, which is carried adjacent another end of body portion **20** by a pin shaft **24** for relative pivotal movement about a second axis **25** disposed essentially parallel to axis **16**; and a constraining device **26**. As will be more fully hereinafter described, constraining device **26** normally serves to bias extension portion **22** into a normal or operating position relative to body portion **20**, as shown in full line in FIGS. **1** and **2**, but permits pivotal movement of the extension portion about axis **25** into an overload position, as shown in phantom line only in FIG. **2**, whenever an operator applies a predetermined operating force F thereto. It will be understood that such predetermined operating force is intermediate that force which will permit the hoist to be operated at its rated load capacity and that force which would result in overloading of the hoist.

As best shown in FIGS. **2**, **3** and **4**, body portion **20** is in the form of a metal casting having a side opening cavity **30**, and end opening cavity **32** and a through opening **34**, which extends in a direction lengthwise of the body portion for placing cavities **30** and **32** in communication.

In accordance with the embodiment of the present invention illustrated in FIGS. **1–4**, constraining device **26** is in the form of a column device including a pair of resiliently deformable relatively thin, metal strip members **36**. Members **36** are disposed in surface engagement and extend lengthwise of the body portion through cavity **30**, opening **34** and cavity **32** for end engagement with generally cylindrically concave bearing surfaces **38** and **40**, which are defined by body portion mounted bearing device **42** and extension portion mounted steel bearing insert **44**, respectively.

A body portion mounted adjustment screw **46** is employed to adjustably limit counter-clockwise movement of the extension portion, as viewed in FIG. **2**, thereby to establish the normal or operating position of the extension portion and its associated bearing surface. Then, by adjustments of threaded bearing device **42** relative to the body portion, a desired initial pre-load may be applied to members **36** in order to adjustably vary the predetermined force F, which will be required to in-

itiate buckling deformation of the members into the phantom line position shown only in FIG. 2. It will be understood that body portion **20** is formed with a rib **48**, which serves to introduce a slight initial bow to members **36** in order to insure that they are eccentrically loaded upon the application of an operating force to the extension portion. By this construction, members **36** will resist buckling during normal hoist operations, but will buckle at a load less than the elastic limit of the material from which they are formed whenever a predetermined operating force is applied to extension portion **22**; such buckling permitting the extension portion to pivot relative to body portion **20**. Pivotal movement of the extension portion provides a clear visual indication to the hoist operator that a hoist overload condition is about to be encountered. Moreover, such pivotal movement serves to reduce the moment arm through which the operating force is applied, thereby to proportionally increase the operating force required to apply the same load to the hoist.

Also, it will be understood that body portion **20** is formed with a concave recess **50** whose surface acts as an abutment limiting the extent of buckling of members **36** to within the elastic limits of the material from which they are formed. Thus, members **36** will serve to automatically return extension portion **22** from its overload to its normal position, as soon as the operating force is reduced to a value below the predetermined value.

Preferably, adjustments of bearing device **42** and set screw **46** are made at the point of manufacture and subsequent tampering therewith is prevented by closing cavity **30** by a guard or seal plate **52**.

FIGS. **5** and **6** illustrate an alternative form of the present overload prevention handle, wherein like or similarly functioning parts are designated by primed numbers. It will be noted that in this form of the invention, side opening cavity **30'** is substantially reduced in lengthwise dimension as compared to cavity **30** and connecting opening **34'** is in the form of a bore opening. Specifically, this form of the invention features a constraining device **26'** having a first member **60**, which is adjustably fixed to body portion **20'** so as to extend into cavity **30'** in substantial axial alignment with opening **34'**; a second member **62**, which is slideably received within opening **34'** so as to have a first end portion extending into cavity **30'** for slideably supported engagement with member **60** and a second end portion extending into cavity **32'**; and a stack of Belleville type spring washers or discs **64**, which is carried by members **60** and **62** and compressible therebetween upon movement of member **62** towards member **60**. The second end portion of member **62** is disposed in engagement with a roller **66**, which is carried on extension **22'** by a pin shaft **68** for rotation about an axis **70** arranged essentially parallel to axis **25'**.

Member **60** is shown as being threadably connected to body portion **20'** for the purpose of adjustably preloading stack **64**. By this arrangement, the value of the predetermined operating force, which will effect compression of stack **64** to permit pivotal movement of extension **22'** into its overload position may be readily varied. Upon removal of the predetermined operating force from handle extension **22'**, stack **64** will expand and serve to automatically return extension **22'** to its normal operating position.

A suitable set screw, not shown, may be provided to adjustably vary the normal operating position of extension **22'**, and a cover or seal plate **52'** may be provided to seal cavity **30'**.

We claim:

1. A handle for preventing overloading of a handle operated mechanism by undergoing a change in shape upon application of a predetermined mechanism operating force thereto, which handle comprises in combination:

an elongated main body portion having one end thereof adapted for operable connection to said mechanism for rotation about a first axis extending transversely of said body portion, said body portion bounding a cavity communicating with an opening arranged to extend through an other end of said body portion remote from said one end;

an extension portion to which mechanism operating forces are to be applied, said extension portion having one end thereof dimensioned to be received within said opening;

pivot shaft means for mounting said one end of said extension portion on said other end of said body portion within said opening to permit said extension portion to extend outwardly through said opening for relative pivotal movement about a second axis arranged essentially parallel to said first axis; and

resiliently deformable constraining means for normally maintaining said extension portion in a normal mechanism operating position in substantial alignment with said body portion while releasing said extension portion for pivotal movement about said second axis away from said normal position upon application of said predetermined operating force thereto, said constraining means biasing said extension portion for return to said normal position upon removal of said predetermined operating force therefrom, said constraining means being arranged to extend lengthwise of said body portion within said cavity for end engagement with said body portion and said one end of said extension portion.

2. A handle according to claim **1**, wherein said constraining means is a column device comprising resiliently deformable relatively thin strip means having opposite ends thereof arranged for bearing engagement with said body portion and said one end of said extension portion, said strip means buckling at a load less than the elastic limit of the material from which it is formed, and said extension portion applying said load to said strip means when said predetermined operating force is applied thereto.

3. A handle according to claim **2**, wherein said body portion includes abutment means disposed within said cavity for engagement by said strip means intermediate said opposite ends after initiation of buckling thereof, said abutment means constraining buckling deformation of said strip means to within a given limit below the elastic limit of the material forming said strip means, said strip means when in engagement with said abutment means constraining said extension portion from further pivotal movement away from said normal position.

4. A handle according to claim 2, wherein said constraining means additionally includes means to adjustably vary the distance between said opposite ends of said strip means when said extension portion is in said normal position, thereby to adjustably vary said predetermined operating force which will effect buckling of said strip means.

5. A handle for preventing overloading of a handle operated mechanism by undergoing a change in shape upon application of a predetermined mechanism operating force thereto, which handle comprises in combination:

an elongated main body portion having one end thereof adapted for operable connection to said mechanism for rotation about a first axis extending transversely of said body portion;

an extension portion to which mechanism operating forces are to be applied;

pivot shaft means for mounting said extension portion on another end of said body portion for relative pivotal movement about a second axis arranged essentially parallel to said first axis; and

constraining means for normally maintaining said extension portion in a normal mechanism operating position in substantial alignment with said body portion while releasing said extension portion for pivotal movement about said second axis away from said normal position upon application of said predetermined operating force thereto, said constraining means tending to return said extension portion to said normal position upon removal of said predetermined operating force therefrom, said constraining means being in the form of a column device disposed to extend in a direction lengthwise of said body portion and having opposite ends thereof arranged for bearing engagement with said body portion and said extension portion, said column device buckling at a load less than the elastic limit of the material from which it is formed, said extension portion applying said load to said column device when said predetermined operating force is applied thereto, said body portion includes an adjustable bearing device having a generally cylindrically concave bearing surface for engaging one of said column ends, said extension portion includes a generally cylindrically concave bearing surface for engaging another of said column ends, said bearing device is adjustable to vary the distance between said bearing surfaces when said extension portion is in said normal position thereby to adjustably pre-load said column device such as to adjustably vary said predetermined operating force which will effect buckling of said column device, said body portion includes abutment means engageable by said column device after initiation of buckling thereof, said abutment means constraining buckling deformation of said column device to within a given limit below the elastic limit of the material forming said column device, and said column device when in engagement with said abutment means constraining said extension portion from further pivotal movement away from said normal position.

6. A handle for preventing overloading of a handle operated mechanism by undergoing a change in shape upon application of a predetermined mechanism operating force thereto, which handle comprises in combination;

an elongated main body portion having one end thereof adapted for operable connection to said mechanism for rotation about a first axis extending transversely of said body portion;

an extension portion to which mechanism operating forces are to be applied;

pivot shaft means for mounting said extension portion on another end of said body portion for relative pivotal movement about a second axis arranged essentially parallel to said first axis; and

constraining means for normally maintaining said extension portion in a normal mechanism operating position in substantial alignment with said body portion while releasing said extension portion for pivotal movement about said second axis away from said normal position upon application of said predetermined operating force thereto, said constraining means tending to return said extension portion to said normal position upon removal of said predetermined operating force therefrom, said constraining means including a stack of spring discs and means for mounting said discs on said body portion, said mounting means including first and second members fixedly and movably mounted on said body portion, respectively, said second member being arranged for engagement by said extension portion, whereby said stack is compressed between said members to permit movement of said extension portion from said normal position when said predetermined operating force is applied to said extension portion.

7. A handle according to claim 6, wherein said first member is a screw device adjustable relative to said body portion, whereby said stack may be pre-loaded to vary said predetermined operating force.

8. A handle according to claim 6, wherein said second member is mounted for reciprocating movement in a direction extending lengthwise of said body portion, and said extension carries a roller rotatable about an axis arranged parallel to said second axis, said roller being arranged for rolling engagement with an end of said second member.

9. A handle for preventing overloading of a handle operated mechanism by undergoing a change in shape upon application of a predetermined mechanism operating force thereto, which handle comprises in combination:

an elongated main body portion having one end thereof adapted for operable connection to said mechanism for rotation about a first axis extending transversely of said body portion, an other end of said body portion being formed with an end opening cavity, a side opening cavity and a bore opening extending in a direction lengthwise of said body portion for placing said cavities in communication;

an extension portion to which mechanism operating forces are to be applied;

pivot shaft means for mounting said extension portion on said other end of said body portion for relative pivotal movement about a second axis arranged essentially parallel to said first axis; and

constraining means for normally maintaining said extension portion in a normal mechanism operating position in substantial alignment with said body portion while releasing said extension portion for pivotal movement about said second axis away from said normal position upon application of said predetermined operating force thereto, said constraining means tending to return said extension portion to said normal position upon removal of said predetermined operating force therefrom, said constraining means including a first member, a second member and a stack of spring washers, said first member being fixed to said body portion and extending into said side opening cavity towards and in substantial axial alignment with said bore opening, said second member being slideably received within said bore opening, said second member having a first end portion extending into said side opening cavity and slideably supported by said first member and having a second end portion extending into said end opening cavity, said stack being carried by said members and compressible therebetween upon movement of said second member towards said first member, said pivot shaft means extends transversely within said end opening cavity for supporting an end of said extension portion therewithin, said extension portion supporting a roller for rotation about an axis arranged essentially parallel to said second axis, and said roller being arranged for rolling engagement with said second end portion of said second member, whereby to effect compression of said stack when said predetermined operating force is applied to said extension portion.

10. A handle according to claim **9**, wherein said first member is a screw device adjustable relative to said body portion, whereby said stack may be pre-loaded to vary said predetermined operating force.

11. A handle for preventing overloading of a handle operated mechanism by undergoing a change in shape upon application of a predetermined mechanism operating force thereto, which handle comprises in combination:

an elongated main body portion having one end thereof adapted for operable connection to said mechanism for rotation about a first axis extending transversely of said body portion, said body portion carrying spaced apart rib means and abutment means arranged intermediate said one end and an other end thereof;

an extension portion to which mechanism operating forces are to be applied;

pivot shaft means for mounting one end of said extension portion on said other end of said body portion to permit relative pivotal movement of said extension portion about a second axis arranged essentially parallel to said first axis; and

a column device having opposite ends thereof arranged for bearing engagement with said body portion and said one end of said extension portion for normally maintaining said extension portion in a normal mechanism operating position in substantial alignment with said body portion while buckling at an extension portion applied load less than the elastic limit of the material from which said column device is formed to release said extension portion for pivotal movement about said second axis away from said normal position upon application of said predetermined operating force to said extension portion, said column device tending to return said extension portion to said normal position upon removal of said predetermined operating force therefrom, said rib means engaging one side of said column device intermediate said opposite ends when said extension portion is in said normal position whereby to introduce a slight bow to said column device to insure eccentric loading thereof upon application of operating force to said extension portion, said abutment means is engageable with an opposite side of said column device intermediate said opposite ends after initiation of buckling thereof whereby to constrain buckling deformation to within a given limit below the elastic limit of the material forming said column device, and said column device when engaged with said abutment means constrains said extension portion from further pivotal movement away from said normal position.

12. A handle according to claim **11**, wherein said column device is defined by a plurality of resiliently deformable relatively thin metal strip members extending between said opposite ends, and said body portion and said extension portion carry generally cylindrically concave bearing surfaces for engaging said opposite ends of said column device, one of said bearing surfaces being adjustable relative to its associated body portion and extension portion to vary the distance between said opposite ends when said extension portion is in said normal position thereby to adjustably vary said predetermined operating force which will effect buckling of said column device.

13. A handle according to claim **12**, wherein said body portion bounds a cavity communicating with an opening arranged to extend through said other end of said body portion, said one end of said extension portion is mounted within said opening by said pivot shaft means, said strip members are arranged to extend lengthwise of said body portion within said cavity, and said rib means and abutment means are arranged within said cavity.

* * * * *