US 20020056952A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2002/0056952 A1

Ohno et al. (43) Pub. Date: May 16, 2002

(54) SHOCK ABSORBING APPARATUS

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(21) Appl. No.: **09/775,631**

(22) Filed: **Feb. 5, 2001**

(30) **Foreign Application Priority Data**

Nov. 13, 2000 (JP) 2000-345550

Publication Classification

(51) **Int. Cl.**[7] **F16F 13/00**; F16F 5/00

(52) **U.S. Cl.** **267/140.12**

(57) **ABSTRACT**

A shock absorbing apparatus that absorbs a shock produced by an abutment of a traveler on a stop member when the traveler is brought to a stop at a predetermined position comprises a leaf spring arranged adjacent to the stop member in substantially face-to-face relationship with a guideway. A free end of the leaf spring abuts slightly on the guideway or with a slight clearance against the guideway. A midportion of the leaf spring is curved gradually apart from the guideway. The traveler is provided with a contact portion that passes over the free end of the leaf spring to contact with the curved midportion before the traveler abuts on the stop member at the predetermined position.

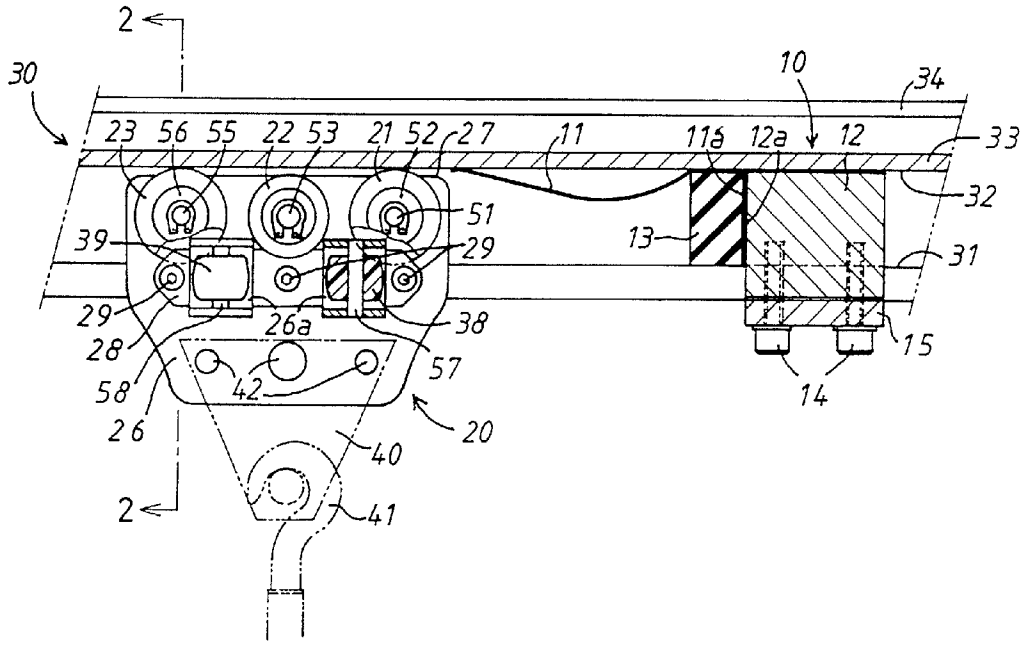

Fig. 1

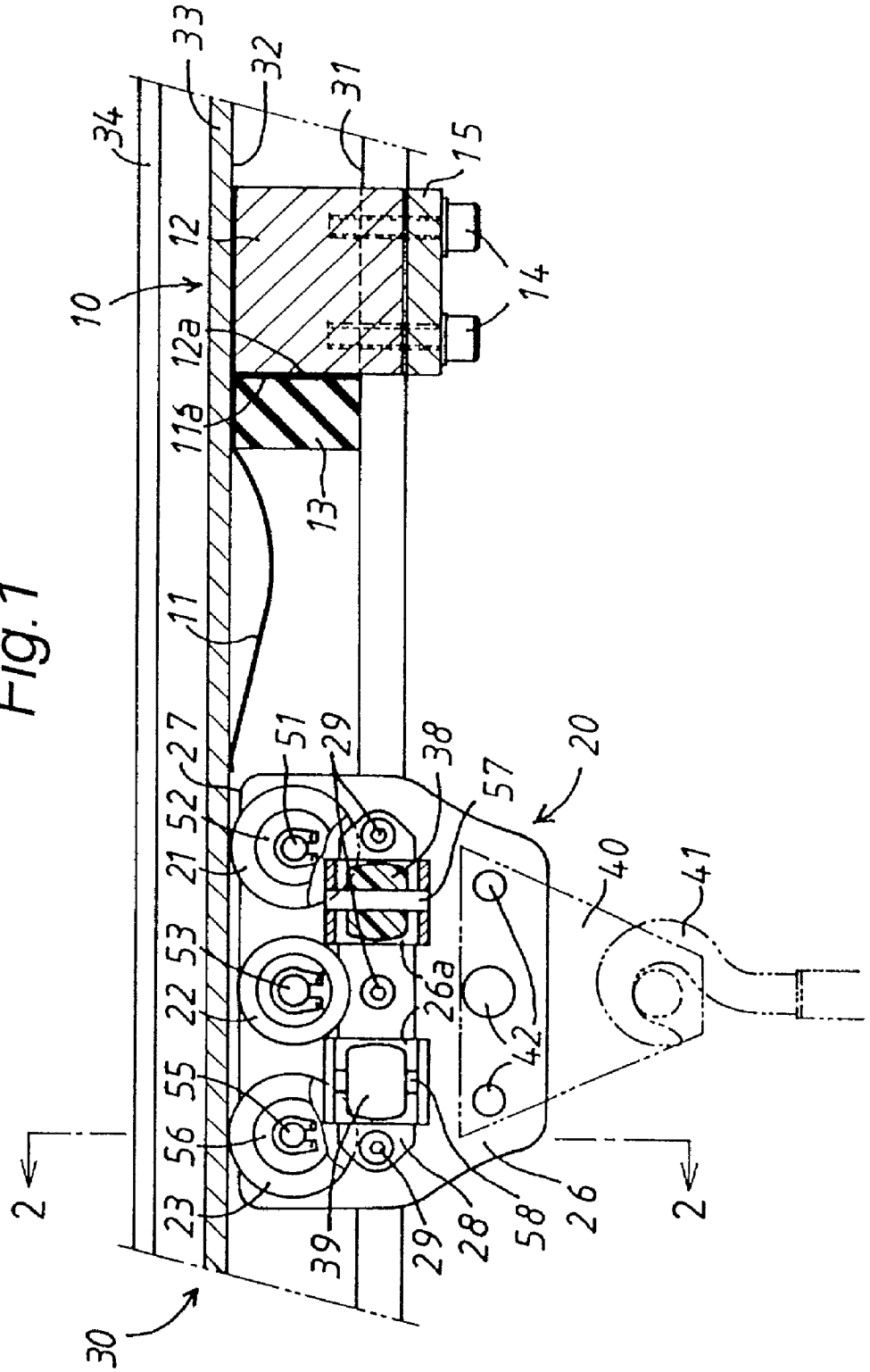
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Fig.2

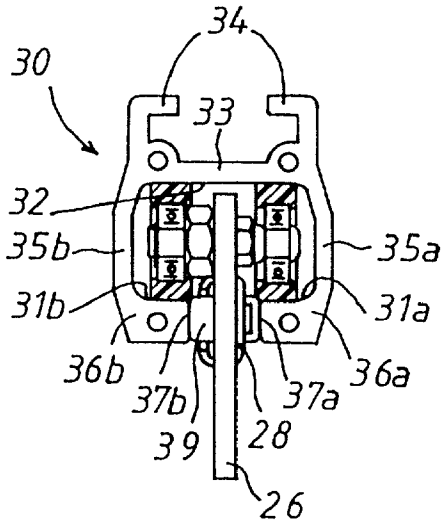
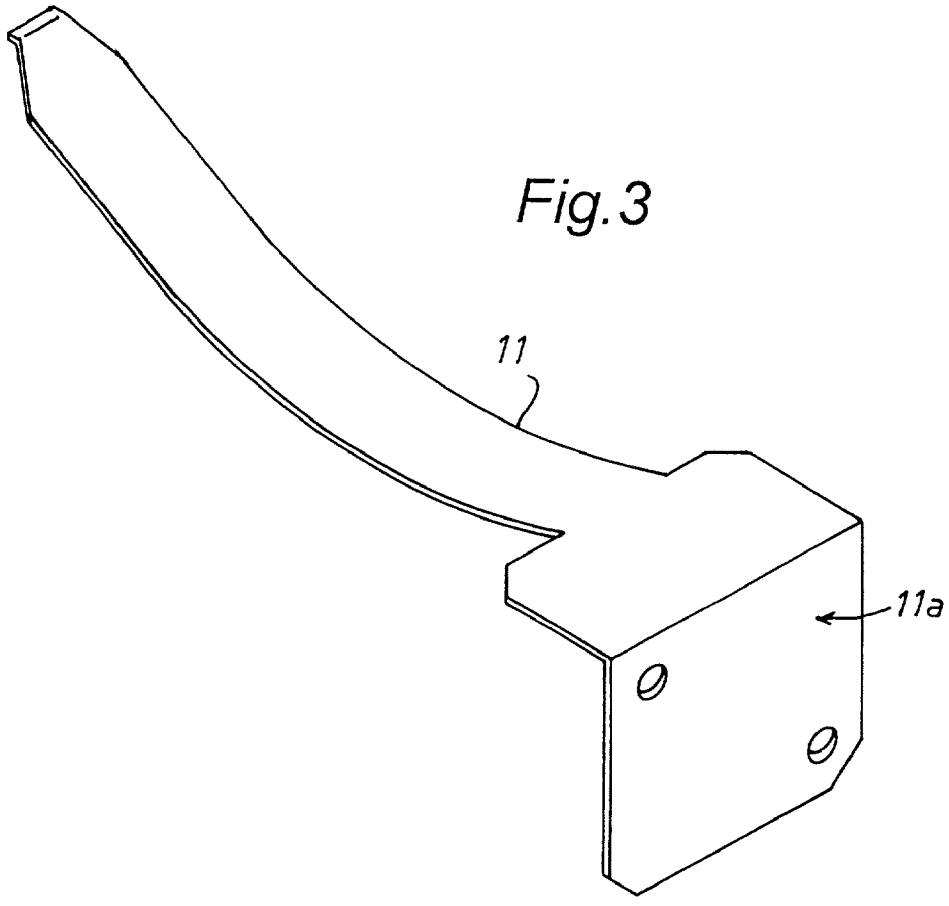


Fig.3



SHOCK ABSORBING APPARATUS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a shock absorbing apparatus for absorbing a mechanical shock that occurs when a traveler running on a guideway is brought to a stop by abutting on a stop member.

[0003] 2. Description of the Prior Art

[0004] A traveler such as a trolley that runs on a guideway is required to be brought to a cushioned stop to convey a load to a predetermined position. It is well known to arrange a resilient member, for example, a rubber or resilient resin pad or a shock absorber to which a traveler is brought engagement resiliently before it abuts on a stop member at the predetermined position.

[0005] However, in the case where the rubber or resilient resin pad is arranged, considerable noise is produced when the traveler brought engagement to the pad. It is also difficult to stop the traveler exactly at the predetermined position because the traveler rebounds from the pad. In the case where the shock absorber is arranged, the noise problem cannot be settled, though the traveler can be brought to an exact stop. The shock absorber comprising a piston and cylinder mechanism, fluid contained in the cylinder and a spring to urge the piston to one end position is expensive and requires large space to be attached.

SUMMARY OF THE INVETON

[0006] It is, therefore, a primary object of the present invention to provide a novel type of a shock absorbing apparatus capable of making a traveler that runs on a guideway stop silently and exactly at a predetermined position.

[0007] Another object of the present invention is to provide a shock absorbing apparatus that is simple in structure and low in cost.

[0008] Further object of the present invention is to provide a shock absorbing apparatus that can be easily disposed adjacent to a stop member on which the traveler abuts at the predetermined position.

[0009] Still another object of the present invention is to provide a shock absorbing apparatus wherein a spring force of a leaf spring urges the traveler to a support surface of the guideway that supports the weight of the traveler when the traveler contacts with the leaf spring. Thereby the traveling speed of the traveler is decreased with keeping the traveler in a stable situation.

[0010] An additional object of the present invention is to provide a shock absorbing apparatus wherein the leaf spring is fixed to the stop member so that the leaf spring is movable therewith when the stop member is moved to alter the predetermined position where the traveler is stopped.

[0011] According to the present invention, the foregoing and other objects are attained by providing within an apparatus which absorbs a shock produced by an abutment of the traveler on the stop member the leaf spring that is arranged adjacent to the stop member in substantially face-to-face relationship with the guideway and comprises a midportion curved gradually apart from the guideway to be contacted by the traveler before the traveler abuts on the stop member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The above and other objects, features and advantages of the invention will be become more apparent from the following description taken in conjunction with the accompanying drawings wherein like references refer to like parts and wherein:

[0013] **FIG. 1** is a longitudinal sectional view of a preferred embodiment of the invention;

[0014] **FIG. 2** is a section taken along the line **2-2** of **FIG. 1**; and

[0015] **FIG. 3** is a perspective view of a leaf spring.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] Referring now to **FIG. 1, a** shock absorbing apparatus **10** in accordance with the invention is shown which absorbs a mechanical shock that is produced when a traveler such as a trolley **20** movably mounted on a long guideway **30** is brought to a stop by abutting on a stop member **12**. As shown in **FIG. 2**, for the purpose of horizontally securing the guideway **30** at an upper part of a factory there is provided a mount portion **34** on a base **33** of the guideway **30**. The guideway **30** has guide portions **35***a*, **35***b* that extend downwardly in parallel relation with each other on both sides of the base **33**. The guide portions **35***a*, **35***b* are provide with horizontally-inwardly extending support portions **36***a*, **36***b* on each lower ends to form support surfaces **31***a*, **31***b* thereon. Rollers **21**, **23** rotatably mounted on the trolley **20** are mounted on the support surfaces **31***a*, **31***b* so that the trolley **20** are guided by the support surfaces **31***a*, **31***b* of the guideway **30** and the weight of the trolley **20** are taken on the support surfaces **31***a*, **31***b*. Auxiliary surface **32** is formed on the under surface of the base **33** in face-to-face relationship with said support surfaces **31***a*, **31***b*. The auxiliary surface **32** abuts with a slight clearance against the summits of the rollers **21**, **23** to prevent the rollers **21**,**23** to move upwardly. Rollers **38**, **39** rotatably mounted on respective vertical axes on the trolley **20** are interposed between vertical surfaces **37***a*, **37***b* formed on the support portions **36***a*, **36***b* in face-to-face relationship, thereby preventing the trolley from swinging transversely.

[0017] A stop member **12** of the shock absorbing apparatus **10** is interposed between the supporting surfaces **31***a*, **31***b* and the auxiliary surface **32**. The stop member **12** is secured to the guideway **30** by bolting a plate **15** that abuts under surface of the guideway **30** onto the stop member **12** between the vertical surfaces **37***a* and **37***b* thereby to clasp the support portions **36***a*, **36***b* between the stop member **12** and the plate **15**. A shock absorbing leaf spring **11** is fixed to the front surface **12***a* of the stop member **12** at one end, being arranged substantially in face-to-face relationship with auxiliary surface **32** along the guideway **30**. The free end of the leaf spring **11** abuts slightly on the auxiliary surface **32**, or may abuts with slight clearance against the auxiliary surface **32**. The midportion of the leaf spring **11** is curved gradually apart from the auxiliary surface **32**. A resilient member **13** is interposed between the stop member **12** and the midportion of the leaf spring **11**. The leaf sprig **11** has a flat portion that contacts with the auxiliary surface **32** between the fixed portion to the stop member **12** and the

curved midportion. The resilient member **13** is supported between the support surfaces **31***a*, **31***b* and the flat portion of the leaf spring **11**.

[**0018**] A body **26** of the trolley **20** is constructed of an approximately rectangular plate that has enough thickness to form a body of a construction. The upper portion of the body **26** is disposed between the support surfaces **31***a*, **31***b* and the auxiliary surface **32**, and the lower portion thereof projects below the guideway **20** through the space between vertical surfaces **37***a* and **37***b*. A front and rear axles **51**, **55** are inserted into holes formed transversely horizontally through the upper front and upper rear portions of the body **26** and held thereto by nuts on threaded portions of the axles **51**, **55**. Front and rear rollers **21**, **23** are respectively rotatably mounted on the both end portions of the front and rear axles **51**, **55** by means of bearings **52**, **56** at both sides of the body **26**. Front and rear rollers **21**, **23** are respectively mounted on the support surfaces **31***a*, **31***b*, and the summits of rollers **21**, **23** abut with slight clearance against the auxiliary surface **32** so that rollers can run along guideway **20**. An auxiliary axle **53** is secured to the body **26** at the upper portion thereof between the front and rear axles **51**, **55** in the same manner as axles **51**, **55**. The auxiliary rollers **22** are rotatably mounted on the both end portions of the auxiliary axle **53** by means of bearings at both sides of the body **26**. The auxiliary rollers **22** support the trolley **20** on the support surfaces **31***a*, **31***b* when the front or rear roller is broken. The front and rear rollers **21**, **23** have a same diameter, but the auxiliary rollers **22** have a slightly smaller diameter than rollers **21**, **23**, thereby being slightly apart from the support surfaces **31***a*, **31***b*. The auxiliary rollers **22** have higher resistance to rotation than the front and rear rollers **21**, **23** to damp the movement of the trolley **20** when the auxiliary rollers **22** make contact with the support surfaces **31***a*, **31***b*. The rollers **21**,**23** are made of nylon resin.

[**0019**] Front and rear rectangular openings **26***a* are formed side by side through vertically middle portion of the body **26**. Side rollers **38**, **39** are respectively disposed in the openings **26***a*. A bracket **26** is fixed by bolts **29** on the side of the body **26**. Upper and lower tabs bent horizontally from the plane of the bracket **26** are inserted into the openings **26***a* to support both ends of vertical axles on which side rollers **38**, **39** are rotatably mounted. The side rollers **38**, **39** are of a diameter slightly smaller than the distance between vertical surfaces **37***a* and **37***b* and project beyond respective sides of the body **26**, being guided by vertical surfaces **37***a*, **37***b* to prevent the trolley from swinging transversely while traveling. The body has holes formed through the lower portion thereof to attach a connecting member **40** on which a hook **41** of a hoist is detachably hung.

[**0020**] The mode of operation of the shock absorbing apparatus will now be briefly described. The hoist is hung on the trolley **20** by hook **41**. A load is tied to the hoist to be lifted up from the ground. The trolley **20** is traveled along the guideway **30** to the predetermined position by an operator. Rollers **21**, **23** roll on the support surfaces **31***a*, **31***b* of the guideway **30**. If the rollers **21**, **23** or axles **51**, **55** are broken, auxiliary rollers **22** abut on the support surfaces **31***a*, **31***b* to prevent the trolley from falling out of the guideway **30**. When the trolley is traveled near to the stop member **12**, a contact portion **27** on the upper portion of the body **26** contacts with the leaf spring **11** of the shock absorbing apparatus **11** to compress the leaf spring **11** toward the auxiliary surface **32**. Leaf spring **11** absorbs the kinetic energy of the trolley **20** to decrease the traveling speed, stopping the trolley **20** exactly at the predetermined position without rebounding when the trolley **20** abuts on the stop member **12**. The spring force of the leaf spring **11** urges the traveler **20** to the support surfaces **31***a*, **31***b* that support the weight of the traveler **20** thereby bringing the traveler **20** a stop in a stable and reliable manner.

[**0021**] The kinetic energy of the trolley **20** while traveling varies depending upon the weight of a load carried by the trolley. When the weight of a load is changed, the shock absorbing apparatus **10** of the present invention can be easily adjusted to absorb the kinetic energy of the trolley **20** by altering the thickness of the leaf spring **11** to change a spring constant.

[**0022**] The leaf sprigs may be arranged substantially in face-to-face relationship with support surfaces **31***a*, **31***b*. The free ends of the leaf springs abuts on the support surfaces **31***a*, **31***b*, and the midportion of the leaf springs are curved gradually apart from the support surfaces **31***a*, **31***b*.

[**0023**] Further, the rollers **21**, **23** may be rotatably mounted on the lower front and lower rear portions of the body **26** thereby the trolley **20** is above the support surface on which the rollers roll.

[**0024**] Still further, shock absorbing leaf spring **11** may be fixed to the base **33** of the guideway **30**.

[**0025**] While particular embodiments of the invention have been described, it will be understood that the invention is not limited thereto since modifications may be made by those skilled in the art, particularly in light of the foregoing teachings. It is therefore contemplated by the appended claims to cover any such modifications that incorporate those features of these improvements in the true spirit and scope of the invention.

What is claimed is:

1. A shock absorbing apparatus which absorbs a shock produced by an abutment of a traveler that runs on a guideway on a stop member when the traveler is brought to a stop at a predetermined position comprising a leaf spring arranged adjacent to a stop member in substantially face-to-face relationship with the guideway; a free end of said leaf spring abutting slightly on said guideway or with a slight clearance against said guideway, a midportion of said leaf spring being curved gradually apart from said guideway, said traveler being provided with a contact portion that passes over said free end of said leaf spring to contact with said curved midportion before said traveler abuts on said stop member at said predetermined position.

2. An apparatus of claim 1, wherein said guideway comprising a support surface for guiding and taking the weight of said traveler and auxiliary surface disposed in face-to-face relationship with said support surface, said leaf spring being arranged in face-to-face relationship with said auxiliary surface.

3. An apparatus of claim 1, wherein, said leaf spring being fixed to said stop member at the end opposite said free end, and a resilient member being interposed between said stop member and a midportion of said leaf spring.

4. An apparatus of claim 2, wherein, said leaf spring being fixed to said stop member at the end opposite said free end, and a resilient member being interposed between said stop member and a midportion of said leaf spring.

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