

[54] **ELEVATOR FLEXIBLE GUIDE CLAMP SAFETY**

979,491	12/1910	Hinkel	187/87
1,178,942	4/1916	Petro et al.	187/88
467,591	1/1892	Fowler et al.	187/88

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[52] U.S. Cl. **187/88, 187/77, 187/87**
 [51] Int. Cl. **B66b 5/16**
 [58] Field of Search 187/83, 86-88, 187/77

[57] **ABSTRACT**

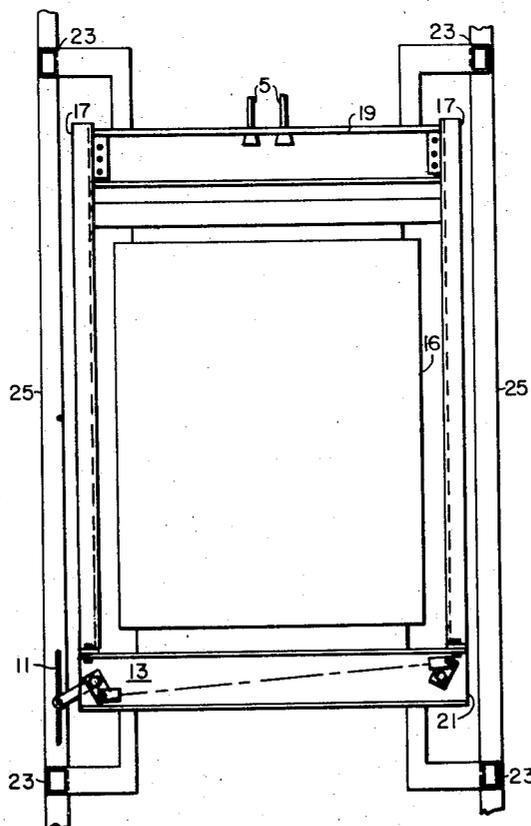
In a compact elevator flexible guide clamp safety, the brake gibs are lifted into engagement with the guide rail by an operating member which extends transversely through the lever arms of the clamp. The mountings for the brake spring connected between the opposite ends of the lever arms provide separate adjustment for jaw opening and spring loading.

[56] **References Cited**

8 Claims, 8 Drawing Figures

UNITED STATES PATENTS

3,249,179 5/1966 Borgman 187/88



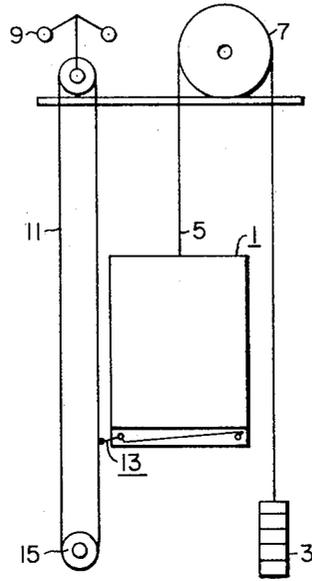


FIG. 1

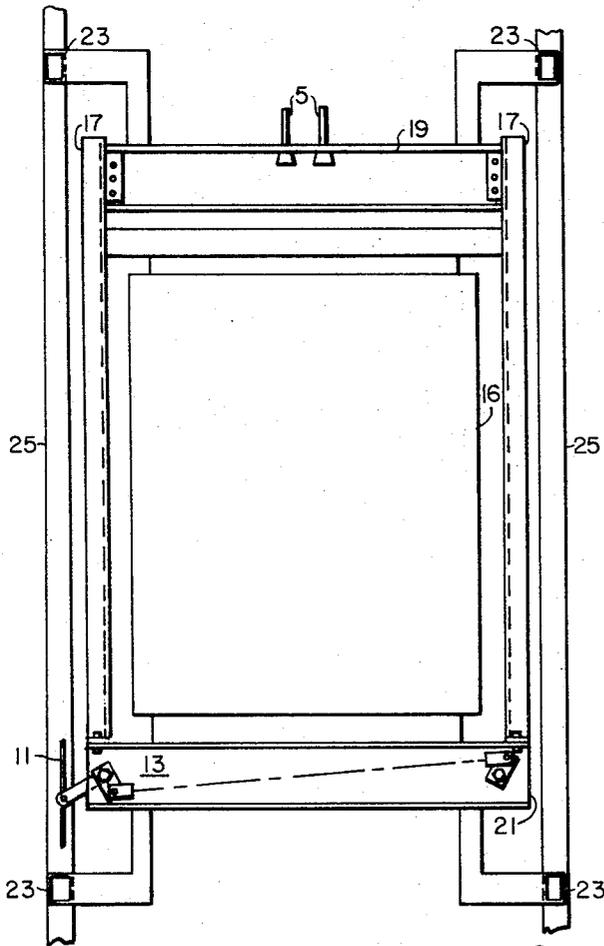


FIG. 2

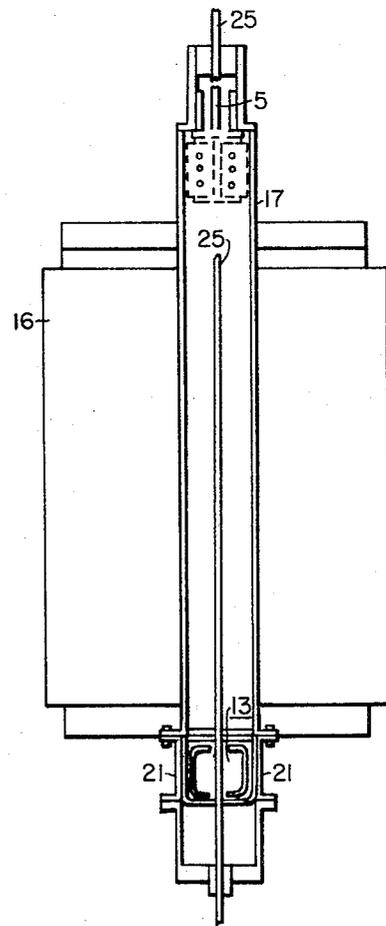


FIG. 3

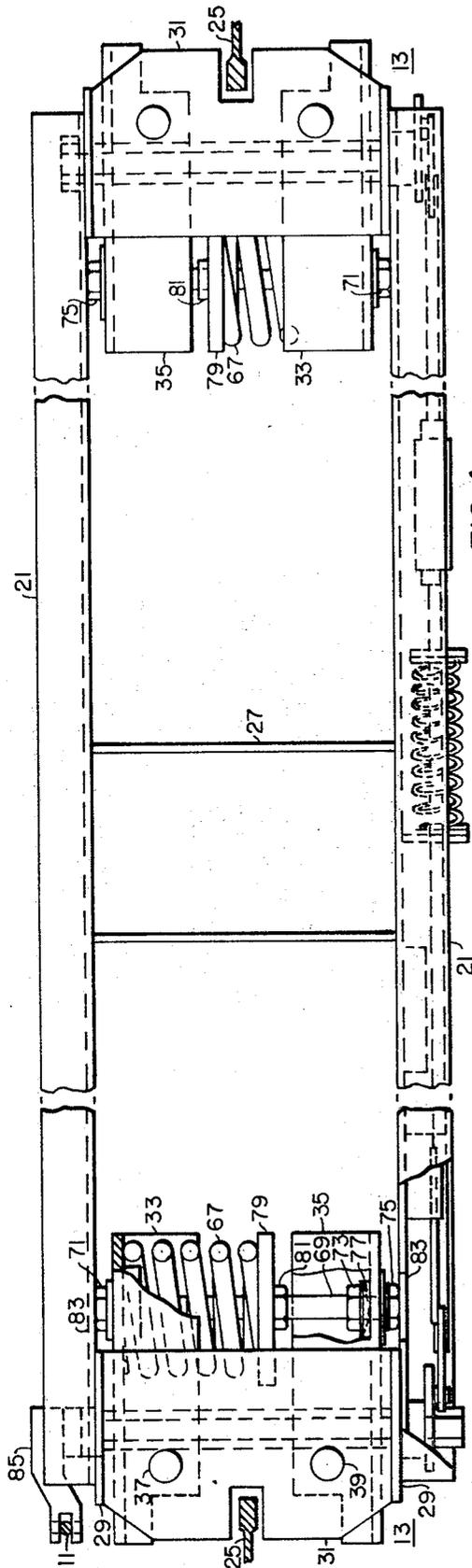


FIG. 4

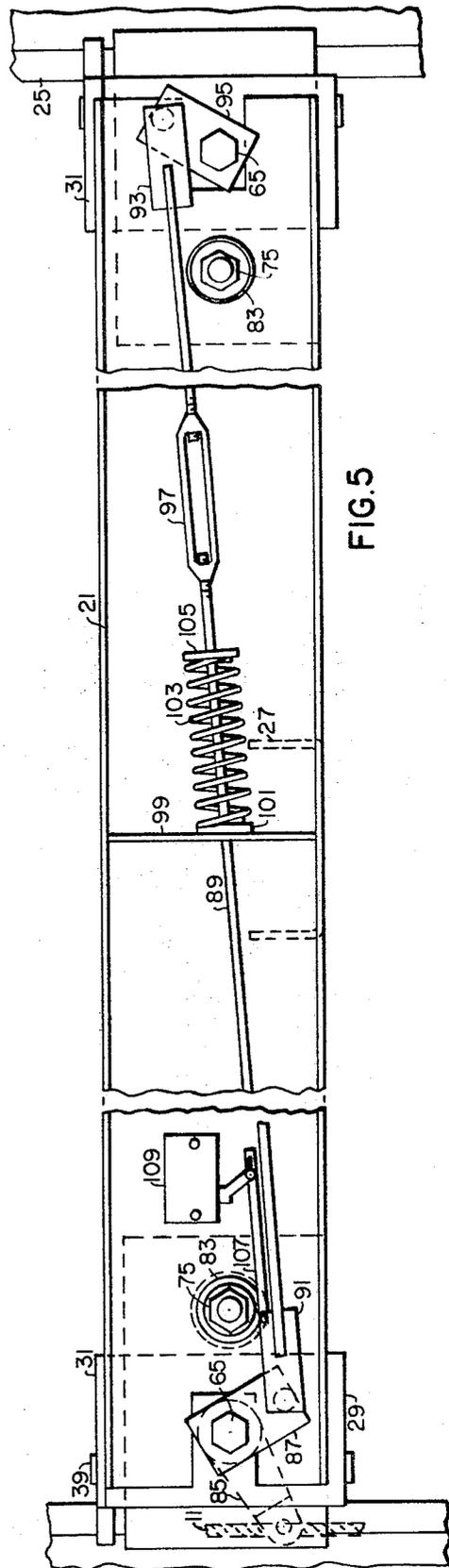


FIG. 5

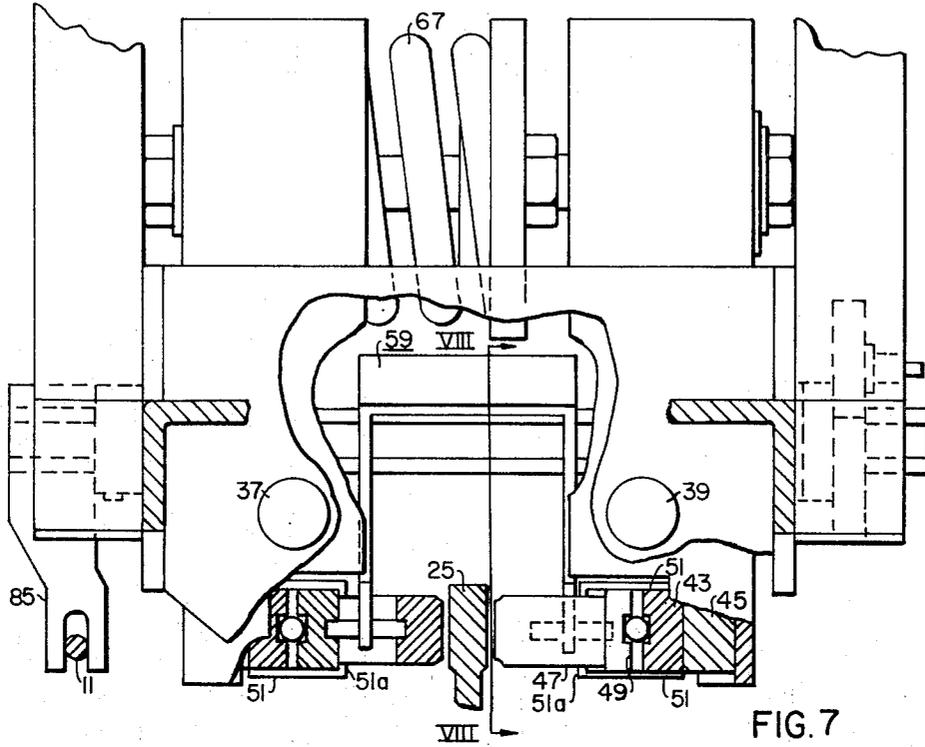


FIG. 7

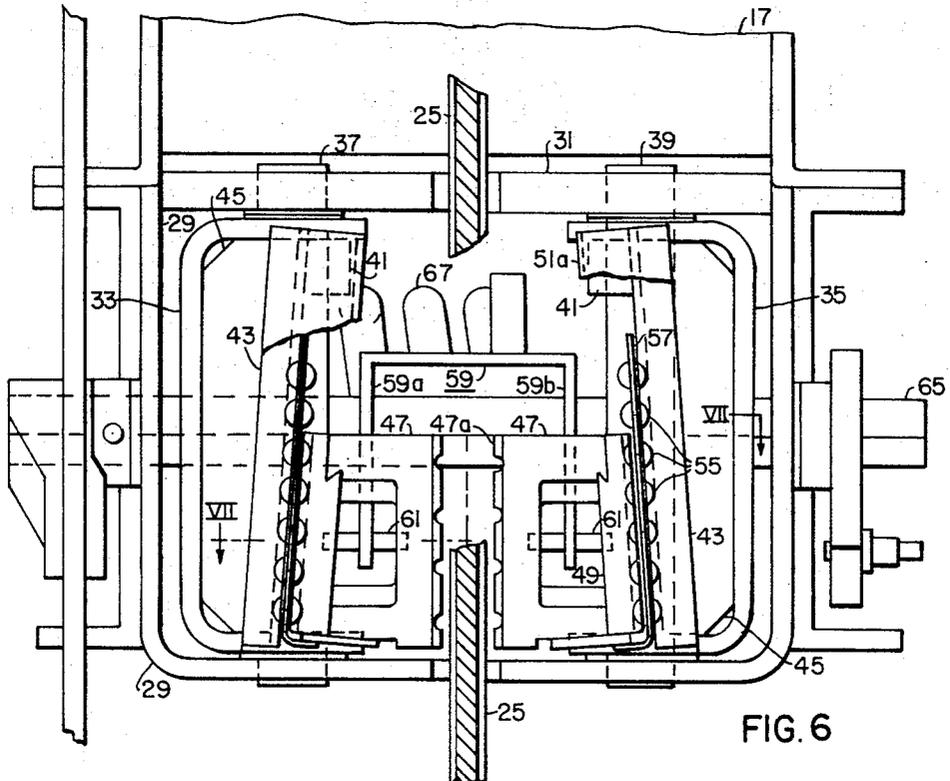


FIG. 6

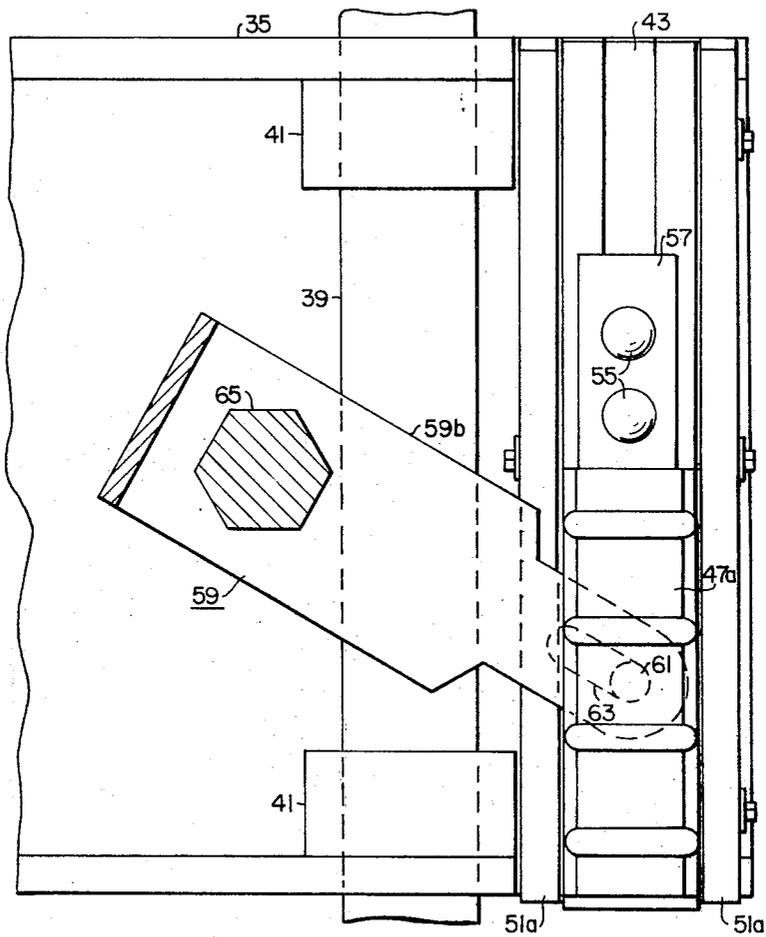


FIG. 8

ELEVATOR FLEXIBLE GUIDE CLAMP SAFETY

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to safety devices for retarding the movement of an elevator car should it over speed in the downward direction and more particularly it relates to safety brakes known as flexible guide clamp safeties.

2. Prior Art

Elevator safety codes require that an elevator car be provided with a safety brake which automatically engages the guide rails and brings the car to a stop should the car over speed in the downward direction.

It is conventional practice to pivotally mount a pair of lever arms to form jaws which straddle the guide rail. The jaws are provided with upwardly converging surfaces which urge brake shoes or gibs toward engagement with the guide rail as the gibs are lifted by an operating mechanism. Engagement of the gibs with the guide rail while the car is traveling in the downward direction, drives the gibs further upward along the wedging surfaces thereby forcing the jaws apart. A spring acting at the opposite ends of the lever arms determines the braking force applied to the gibs.

The operating mechanism for lifting the gibs usually takes the form of levers or rods which urge the gibs upward. In prior art safety clamps these rods or levers usually extend from above or below or around in front of the jaws thereby increasing the outer dimensions of the mechanism. The trend has been to reduce the size of the safeties while maintaining their ruggedness and increasing their reliability. Although safety clamps such as those disclosed in U.S. Pat. Nos. 2,716,467 and 3,481,432, have been devised which confine the lever arms to the space between the safety channels found underneath elevator cars, the operating mechanism extends outside the safety channel. With such an arrangement it becomes desirable to delay installation of the safety until the car is in place on the job to avoid damage during shipment.

The clamp disclosed in U.S. Pat. No. 3,346,074 permits independent adjustment of the spring force and the setting of the jaw opening by providing separate set screws which limit the travel of the two lever arms and a separate assembly which adjusts the spring setting.

All of the prior art safety clamps are constructed of numerous parts many of which are castings. Such designs make the safeties unnecessarily complex and add to the manufacturing costs.

SUMMARY OF THE INVENTION

According to the invention, the gibs on a flexible guide clamp safety are lifted into engagement with the guide rail by throw levers connected to an operating member which extends horizontally through the lever arms. In a preferred embodiment of the invention, the operating member is a shaft which extends through the safety channels and is rotated by an actuating lever connected to the shaft external of the safety channels. With the height of the lever arm being less than that of the safety channels, the guide clamp safety is completely confined to the space between the channels. The lever arms are preferably constructed of standard channel members which are independently pivoted on separate king pins. In the embodiment of the invention disclosed, the throw levers are the two legs of a U-

shaped member connected to the operating shaft for rotation therewith.

The coil spring which acts against the inner ends of the lever arms is mounted with a simple device which provides independent adjustment for jaw opening and spring loading. A threaded shaft passing through the axis of the spring is slidable through apertures in the lever arms. A stop on one end of the shaft limits the travel of one of the lever arms. The opposite end of the shaft is adjustably clamped to the other lever arm. A suitable clamp can be formed by a pair of nuts tightened up against either side of the lever arm. Adjustment of the distance between the stop, which may also be a nut, and the clamping nuts determine the spacing of the jaws when the brake is in the unactuated condition. A retainer threadedly movable on the threaded shaft between the lever arms serves as a bearing surface for the spring which is mounted between the retainer and the unclamped lever arm. Adjustment of the position of the retainer varies the loading of the spring.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration of an elevator installation embodying the invention;

FIG. 2 is an elevation view of an elevator car incorporating the invention;

FIG. 3 is a side elevation view of the elevator car in FIG. 2;

FIG. 4 is a plan view with parts missing and parts cut away of a flexible guide clamp safety according to the invention;

FIG. 5 is a side elevation view of the flexible guide clamp safety shown in FIG. 4;

FIG. 6 is an enlarged end elevation view of the flexible guide clamp safety shown in FIG. 4;

FIG. 7 is a plan view with parts cut away and parts sectioned along the line VII—VII of FIG. 6; and

FIG. 8 is an enlarged view of a portion of the flexible safety guide clamp shown in FIG. 7 taken along the line VIII—VIII.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 schematically illustrates an elevator system in which an elevator car 1 and a counterweight 3 are suspended from opposite ends of a cable 5. The cable 5 is reeved over a traction sheave 7 which is driven by a motor (not shown). A centrifugal force governor 9 is driven by a rope 11 connected to the flexible guide clamp safety mounted on the car and identified by the general reference character 13. The loop of the rope 11 passes over the pulley 15 at the bottom of the hoistway. As the car 1 travels up and down the hoistway the rope 11 drives the governor at a speed proportional to the speed of the car. If the speed of the car exceeds a predetermined limit in the downward direction, the governor grasps the rope 11. The resultant relative movement between the rope 11 and the car actuates the flexible guide clamp safety 13. Such governor devices are well known in the elevator art.

Referring to FIGS. 2 and 3 it can be seen that the elevator car includes a cab 16 which is supported by a sling made up of vertical stiles 17, a pair of upper horizontal channel members 19 and a pair of lower horizontal channel members 21 also referred to as safety channels. The supporting cables 5 are connected to the upper channel members. The elevator car is guided in

its vertical movement through the hoistway by guides 23 mounted above and below the car on each side which cooperate with rails 25 secured to the sides of the hoistway.

Referring to FIGS. 4 and 5, a U-shaped bumper plate 27 is welded between the safety channels 21 beneath the center of gravity of the car. The flexible guide clamp safeties at either end of the safety channels are essentially identical, therefore only the assembly at the lefthand end as viewed in FIG. 4 will be described in detail. An upward facing U-shaped member 29 (see FIG. 6) is welded to the ends of the safety channels 21. A steel stop plate 31 having a slot for receiving the guide rail 25 is welded to the upward extending legs of the U-shaped member.

Lever arms 33 and 35 are mounted for pivotal movement by king pins 37 and 39 journalled at their upper ends in the steel stop plate 31 and at their lower ends in the base of the U-shaped member 29. Preferably the lever arms are in the form of standard channel members which are pivoted for rotation about an axis through their flanges. Bosses 41 welded to the flanges of the lever arm channels give rigidity to the pivotal mountings. The lever arms are independently rotatable about their king pins with their outer ends forming a pair of jaws which straddle the guide rail 25. The outer ends of the flanges are recessed with the lower flanges being cut closer to the web than the upper flanges. Gib guide plates 43 welded to the recessed flanges on the lever arms form upwardly converging faces on the jaws. Braces 45 welded to the webs of the lever arm channels in back of the gib guide plates stiffen these members. U-shaped gibs 47 are supported by gib guides 49 which exceed the width of the gibs thereby forming lips which are engaged by flanges 51a on guide keeper plates 51 connected to either side of each of the gib guide plates 43. Both the gib guide plates 43 and the gib guides 49 are provided with races 53 which receive ball bearings 55. The ball bearings 55 are maintained in spaced relationship by carriages 57. It can readily be seen from FIG. 6 that if the gibs 47 are raised vertically, they will converge horizontally as the gib guides follow the gib guide plates 43 until the braking surfaces 47a come in contact with the guide rail 25. Friction forces between the gib braking surfaces 47a and the guide rail will cause the gibs to further drive upward against the wedging surfaces of the guide plates. The ball bearings provide low friction coupling between the gib guide keepers and the gib guide plates.

The gibs 47 are lifted initially by throw levers 59a and 59b which in the embodiment of the invention disclosed form the two legs of the U-shaped member 59. The throw levers are coupled to the gib through pins 61 which pass through slots 63 in the throw levers (see FIG. 8). Apertures in the opposite ends of the throw levers 59a and 59b receive a horizontal shaft 65 which passes freely through openings in the lever arms 33 and 35 and is journalled for rotation about a horizontal axis in the safety channels 21. In the preferred embodiment of the invention, a rugged inexpensive construction is achieved by cutting the shaft 65 from standard hexagonal bar stock and fabricating the U-shaped member whose legs form the throw levers from stamped sheet material. Rotation of the shaft 65 in a counterclockwise direction as shown in FIG. 8 and in a manner to be described below, causes the throw levers 59a and 59b to lift the gibs 47 through the pins 61 until the gibs come

in contact with the rail 25. Frictional engagement between the braking surfaces 47a of the gibs on a downwardly travelling car tends to drive the gibs with their gib guides 49 further upward along the converging gib guide plates 43. This wedging effect produces horizontal forces tending to spread the jaws apart by rotating the lever arms about the king pins 37 and 39. This rotation which tends to bring the opposite ends of the lever arms toward each other is resisted by a large compression spring 67. The force exerted by the spring 67 in resisting rotation of the lever arm determines the braking force applied by the gibs to the guide rail. This braking force increases as the gibs are drawn upward along the wedging surfaces of the gib guide plates until the gibs reach the lower surface of the steel stop plate 31. Once the gibs reach this point the braking force remains constant.

The spring 67 is mounted to the lever arms for independent adjustment of the braking force and the opening of the jaws when the brake is disengaged. To this end, a threaded shaft 69 passes freely through the webs of the lever arms 33 and 35 near the ends of the lever arms opposite the jaws. A stop nut 71 larger than the opening in the lever arm 33 is threadedly affixed to one end of the threaded shaft. Alternatively, a bolt having a head 71 could be utilized in place of the shaft 69 and nut 71. The opposite end of the threaded shaft is firmly clamped to the other lever arm. This may be accomplished by nuts 73 and 75 which abut either side of the web of the lever arm 35. Preferably the nut 73 on the inside of the lever arm may take the form of an elastic stop nut which mates with a self aligning base assembly 77 affixed to the lever arm. The spring 67 is held in axial alignment with the threaded shaft 69 between the lever arm 33 and a retainer 79 which may be adjustably positioned on the threaded shaft 69 by manipulation of the stop nut 81. With the gibs 47 retained at their lower limit of travel where they are not in engagement with the guide rail, the spring 67 bearing against the web of the lever arm 33 exerts a force on the retainer 79 which being rigidly attached to the threaded shaft tends to push the lever arm 35 away from the lever arm 33 to the extent permitted by the stop nut 71. Adjustment of the position of the retainer 79 on the threaded shaft adjusts the loading on the spring 67, while adjustment of the length of the threaded shaft between the stop nut 71 and the clamped position of the lever arm 35 determines the opening of the jaws. It is readily apparent that independent adjustment of the spring loading and the jaw opening may be made with this very simple device. Apertures 83 in the safety channels 21 prevent interference with the threaded shaft.

As mentioned above, the flexible guide clamp safeties at each end of the safety channel are essentially identical in construction. However, the actuating mechanism through which the operating shafts 65 are rotated are not identical. A lever 85 on one end of the operating shaft 65 of the lefthand clamp safety as shown in FIG. 4 is connected to the governor rope 11 through a suitable cable coupling. Continued downward movement of the car when the governor has restrained the rope 11, causes the lever 85 to rotate the shaft 65 in a clockwise direction as viewed in FIG. 5 to actuate the lefthand clamp safety. Rotation of the shaft 65 also causes rotation of a lever arm 87 connected to the opposite end of the shaft. A tie rod 89 inserted in a threaded block 91 pivotally connected to the lever 87

imparts a counterclockwise rotation to the shaft 65 of the righthand clamp safety through an additional threaded block 93 pivotally connected to a lever 95 mounted on the righthand operating shaft 65. Therefore it can be seen that rotation of the lefthand shaft 65 by the governor rope 11 results in rotation of the operating shaft 65 on the righthand unit so that the flexible guide clamp safeties are operated simultaneously. A turn buckle 97 permits adjustment of the tie rod 89.

A vertical stiffener 99 welded to the center of the lower safety channel as viewed in FIG. 4 is counter sunk to receive a seat 101 for a compression spring 103, which bears against a retainer 105 connected to the tie rod 89. The spring 103 tends to urge the tie rod 89 to the right as viewed in FIG. 5 which biases the gibs 47 to the unoperated position. A push rod 107 also connected to the threaded block 91 is pivotally connected to the actuating lever on an electrical switch 109 which provides an electrical signal for the elevator supervisory system when the flexible guide clamp safeties are actuated.

In summary, it can readily be seen that a simple compact flexible guide clamp arrangement has been disclosed. The fact that the operating member that lifts the gibs into engagement with the guide rail passes through the lever arm of the guide clamp makes possible an assembly which fits entirely within the dimensions of the elevator safety channels. Although the operating member has been shown as a rotating shaft, other operating members having other mechanical movements such as linear vertical movement could be utilized. The use of standard stock materials such as the U-shaped channel and the flat steel plate which form the supporting structure, the standard channel members used for lever arms, the standard hexagonal bar stock used as the operating shaft, the stamped sheet throw levers and the simple threaded shaft mounting for the braking spring produce a unique combination offering low cost and durability.

We claim as our invention:

1. An elevator flexible guide clamp safety adapted for use in an elevator system having an elevator car and guide rails for guiding the vertical movement of the car through a hoistway, said clamp safety including a pair of lever arms, mounting means for mounting said lever arms intermediate their ends for rotation in a horizontal plane with corresponding ends of each lever arm forming a pair of jaws which straddle the guide rail, said jaws being provided with upwardly converging wedging surfaces, brake gibs slidably connected to said wedging surfaces for converging against the guide rail when lifted, throw levers connected to said brake gibs, an operating member extending substantially horizontally through at least one lever arm and connected to said

throw levers between the lever arms for lifting the gibs when actuated, and actuating means connected to the operating member outside of said lever arms and operative to effectuate lifting of the gibs through the operating member and the throw levers.

2. The flexible guide clamp safety of claim 1 wherein the operating member is a shaft which is rotated by the actuating means and wherein the throw levers are connected to the shaft for rotation therewith.

3. The flexible guide clamp safety of claim 1 wherein the mounting means includes two spaced vertical king pins for separately mounting said lever arms for rotational movement.

4. The flexible guide clamp safety of claim 3 wherein the lever arms comprise channel members and wherein the king pins are journalled through the flanges of the associated channel members.

5. The flexible guide clamps safety of claim 1 including a compression spring mounted transverse to the lever arms between the ends of the lever arms opposite the jaws and operative to apply a predetermined brake force to the gibs through the jaws when said gibs come in contact with said rail.

6. The flexible guide clamp safety of claim 5 wherein said operating member comprises a rotatable operating shaft extending substantially horizontally through said lever arms between said king pins and said compression spring.

7. The flexible guide clamp safety of claim 5 wherein the means for mounting said spring includes a threaded shaft passing through the axis of the spring and slidable through apertures in the lever arms, a stop connected near one end of the threaded shaft outside of a first one of the lever arms, said stop being larger than the aperture in the associated lever arm, clamping means for clamping the other end of the threaded shaft to the other lever arm and a retainer adjustably mounted on the threaded shaft intermediate the lever arms forming a bearing surface for said spring, said spring being retained between said retainer and said first lever arm, whereby adjustment of the space between the stop and the clamping means adjusts the closing limit of the jaws while adjustment of the position of the retainer independently adjusts the loading of the spring.

8. The flexible guide clamp safety of claim 1 adapted for use with an elevator car having a pair of horizontally spaced safety channels mounted under the car, wherein the clamp safety assembly fits within the vertical height of the safety channel with the operating member extending through an aperture in the safety channel and an actuating means connected to the operating member outside of the safety channel.

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