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SAFETY HINGE LIMITING APPARATUS

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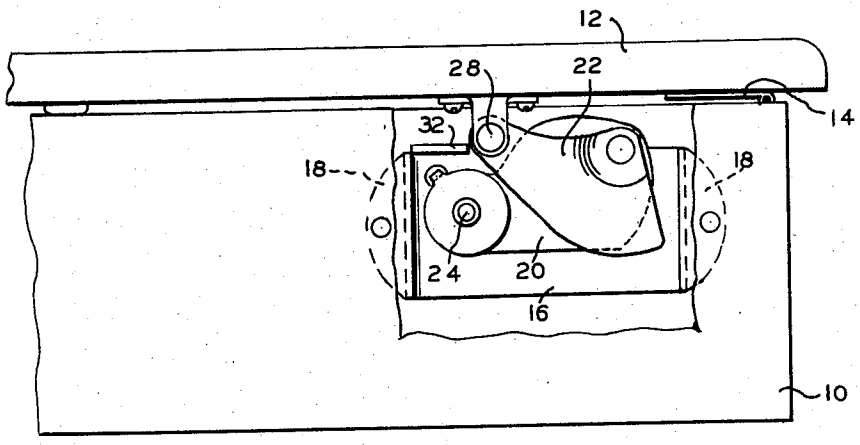

FIG. 1

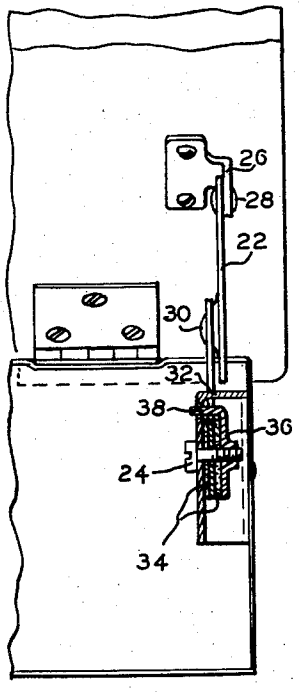

FIG. 3

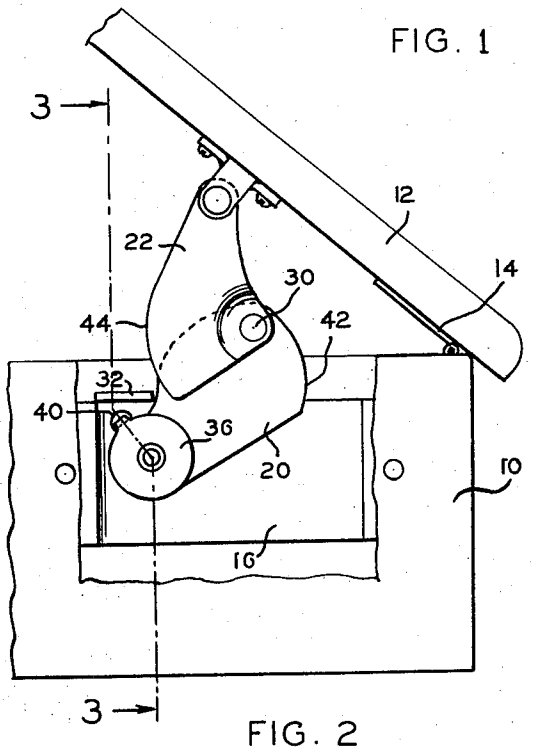

FIG. 2

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SAFETY HINGE LIMITING APPARATUS

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3 Claims. (Cl. 217—60)

This invention relates to hinge limiting apparatus, and more particularly to hinge limiting apparatus for desk tops pivotally connected to open desks or the like.

In designing mechanisms for limiting and retarding the pivotal motion of desk tops of the type commonly employed in schools, a number of factors are important. In the first place, it is highly desirable to provide a hinge limiting device which is safe. In other words, when it employs moving elements, these elements should not cross each other in scissors fashion and thereby present an arrangement in which fingers could be caught or in which other elements might become jammed. A second important design consideration relates to the inherent durability of the device under conditions of operation. The critical point in opening the desk top is when it reaches the fully opened position. At that point the user of the desk may negligently tend to push the desk top with excessive force against the limit stop and thereby damage the hinge limiting apparatus. Thirdly, it is highly desirable to provide a friction element which is neat, compact, easily adjustable, and replaceable.

Accordingly it is an object of our invention to provide a hinge limiting device for a school desk top or the like which is inherently safe and presents no shearing surfaces which might otherwise cut or jam articles placed therebetween. Another object of our invention is to provide such a hinge limiting apparatus in which friction elements retard the opening motion of the desk top as it approaches the fully opened position and thereby effectively cushion the shock of the desk top as it comes to the fully opened limit stop. Still another object of our invention is to provide friction retarding mechanism which is highly efficient in operation, durable, easily adjustable and readily replaceable.

In the accomplishment of these and other objects of our invention in a preferred embodiment thereof, we employ a conventional school desk having a hinged top and an open body portion. The hinge limiting device of our invention is secured on the inside of the desk to the side wall thereof and to the underside of the desk top about 5" or 6" toward the front of the desk from the desk from the hinge. The base element of the hinge limiting device comprises a metal housing secured to the side wall of the desk, and the moving elements include a base link pivotally connected to the housing and a traveling link pivotally connected to the desk top. The free ends of the two said links are interconnected. The two links assume a roughly horizontal position when the desk top is closed, and when it is open, they rise upwardly to a more vertical and extended position.

It is a feature of our invention that no shearing surfaces are exposed during the operation of the hinge limiting device due to side extensions integral with both of the link elements. As the links operate, the edges of these extensions travel up and down without ever presenting any substantially acute angle between them which would otherwise result in a shearing action. Another feature of our invention relates to retarding the motion of the

desk top as it approaches the upper limit. This is done in our invention by providing a friction shoe bearing against the base link so as to retard its motion, and by further arranging the elements so that the motion of the links increases in proportion as the desk top approaches the fully open position. This, in turn, increases the effective frictional resistance of the links to opening motion of the desk top and is further aided in this regard by a gradual reduction in the effective leverage of the links against the retarding forces of the friction means. In this way the retarding friction of the device increases substantially as the desk top approaches the fully open position and thereby effectively cushions the motion of the desk top against a solid impact against the upper limit. Still another feature of our invention relates to the friction element itself. It comprises a pair of simple leather washers applied at pivot point of the base link and is easily installed, adjusted and replaced.

Further objects and features of our invention will best be understood and appreciated from a detailed description of a preferred embodiment thereof, selected for purposes of illustration, and shown in the accompanying drawings, in which:

Fig. 1 is a view in side elevation of the hinge limiting device of our invention installed in a school desk, showing the side of the desk broken away to expose the operating elements of the hinge limiting device;

Fig. 2 is a view in side elevation similar to Fig. 1 except that the desk top is shown in the fully open position; and

Fig. 3 is a sectional view in end elevation along the lines 3—3 of Fig. 2.

In the preferred embodiment of our invention herein shown, we attach our hinge limiting device to a conventional school desk **10**, having a desk top **12** pivotally connected to the desk **10** by means of a hinge **14**. It will be understood, of course, that the details of the desk **10**, the top **12** and the hinge **14** are not important to this invention because numerous other varieties of desks than the precise form herein shown may be employed with equal satisfaction.

The hinge limiting device of our invention has as a base support a housing **16** of roughly rectangular shape and having side flanges **18** through which the housing **16** is bolted or riveted to the inner side wall of the desk **10** adjacent to the hinge **14**. The housing **16** is made of heavy sheet metal in order to serve as a solid foundation for the moving parts of the hinge limiting device which includes a base link **20** and a traveling link **22**. The base link **20** is pivotally connected to the housing **16** by means of a threaded pivot pin **24**, and the traveling link **22** is pivotally connected to a bracket **26** by means of a short pivot pin **28**. The bracket **26** is secured to the desk top **12** by means of screws. The links **20** and **22** are pivotally interconnected at their free ends at **30**.

When the desk top is closed, as may be seen in Fig. 1, the links **20** and **22** assume a roughly horizontal position extending to the rear of their respective pivotal connections **24** and **28**, and when the desk top is opened, as may be seen in Fig. 2, the links **20** and **22** extend upwardly in a more vertical and longitudinally aligned attitude.

In order to limit the motion of the desk top **12** at the fully open position, we provide a limit stop **32** in the upper portion of the housing **16** lying in the path of the link **20** so that when the desk top is fully opened, the link **20** abuts the limit stop **32** thereby preventing any further opening motion of the desk top **12**. In addition, in order to retard the motion of the desk top, we provide a pair of leather friction washers **34** flanking each side of the link **20** at its pivot **24**. The washers are held in place and rotate about the axis provided by the pivot **24**, with

one washer 34 being sandwiched between the link 20 and the housing 16. The other washer 34 is held in place by means of a cap 36 threaded to the pivot pin 24 and held against rotation by means of an outwardly extending ear 38 integral with the cap 36 and passing through a small opening 40 in the housing 16. In this way the washers 34 may be easily installed, repaired or replaced simply by loosening the threaded pivot pin 24; and tightening the pivot 24 results in increasing the frictional resistance of the washers 34 to pivotal motion of the link 20. Thus it will be seen that the washers 34 frictionally resist the opening motion of the desk top 12 which causes the links 22 and 20 to pivot. However, it will be noted in addition that as the links 20 and 22 approach the more vertical position corresponding to the fully opened condition of the desk top 12, the leverage of the links 20 and 22 against the frictional retarding force of the washers 34 decreases and concurrently the rate of motion of the links increases proportionately to the rate of motion of the desk top 12. These two factors result in causing the links 20 and 22 increasingly to resist the opening forces applied to the desk top 12, and thereby cushion the impact of the link 20 against the limit stop 32 when the desk top 12 reaches the fully opened position.

Since the links 20 and 22 move upwardly and downwardly as the desk top is moved, in an essentially folding or jackknifing relation, a potentially dangerous relationship between the two links exists. We overcome this, however, by providing a side extension 42 for the link 20 and a side extension 44 for the link 22. The side extension 42 curves outwardly from the pivot 30 on the link 20 and is contoured to provide a substantially vertical surface for the link 20 as it moves upwardly and downwardly adjacent to the upper edge of the housing 16. The side extension 44 of the link 22 conversely lies on the forward side of the link 22 from the pivot 30 roughly adjacent to the limit stop 32 so that as the link 22 passes upwardly and downwardly, its side extension 44 remains substantially adjacent to the limit stop 32 thereby avoiding any marked shearing action between these two elements.

Since numerous minor variations of this preferred embodiment of our invention will now be apparent to those skilled in the art, it is not our intention to confine the invention to the precise form herein shown, but rather to limit it in terms of the appended claims.

Having thus described and disclosed a preferred embodiment of our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. Safety hinge limiting apparatus for a desk top hinged to an open desk comprising: a base link pivotally connected to said desk; a traveling link pivotally connected to said desk top; said base and traveling links each having a free end and means for pivotally interconnecting said free ends; friction means for retarding the pivotal motion of said links comprising a friction washer located at the pivotal conection between said desk and base link and frictionally engaging said base link; a shallow housing mounted on said desk surrounding the pivotal connection between said base link and said desk; an upper opening in said housing through which both said links move when pivoted; a limit stop at one end of said opening limiting the upward travel of said base link; and a side extension on said traveling link forming a web substantially in the plane of motion of said traveling link and having a marginal edge following a curve spaced from the pivotal connection between said traveling link and said base link by a dimension slightly less than the distance between said latter mentioned pivot and said limit stop throughout the pivotal movement of the link whereby said marginal edge follows a path substantially adjacent said limit stop throughout the pivotal motion of said links when said desk top is raised and lowered.

2. Safety hinge limiting apparatus for a desk top hinged to an open desk comprising: a shallow housing mounted on an interior side wall of said desk; a base link pivotally connected to said housing and mounted within said housing; a traveling link pivotally connected to said top; a pivotal connection between the ends of said base and traveling links; friction means for retarding the pivotal motion of said links including a leather washer located at the pivotal connection between said base link and housing; a fixed limit stop located in the path of said base link and abutting said base link when said base link is pivoted upwardly in response to upward pivotal motion of said desk top to the fully raised position; and a side extension on said traveling link forming a web substantially in the plane of motion of said traveling link and having a marginal edge following a curve spaced from the pivotal connection between said traveling link and said base link by a dimension slightly less than the distance between said latter mentioned pivot and said limit stop throughout the pivotal movement of the link whereby said marginal edge follows a path substantially adjacent said limit stop throughout the pivotal motion of said links when said desk top is raised and lowered.

3. The safety hinge limiting apparatus defined in claim 2 further characterized by a rearwardly extending extension on said base link having a marginal edge forming a curve and spaced from said base link pivot to define between the upper edge of said housing and said latter mentioned marginal edge a substantially right angle for all positions of said base link.

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