July 12, 1955 A. W. McNEILL 2,712,664

HINGED LAST

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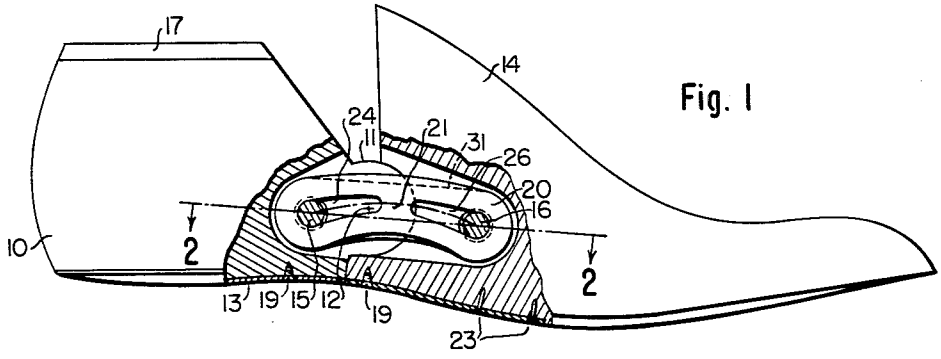


Fig. 1

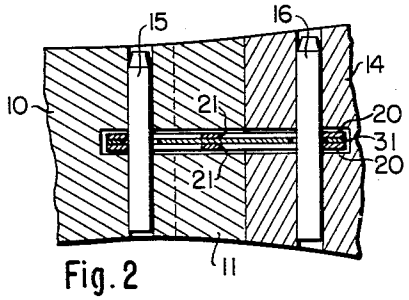


Fig. 2

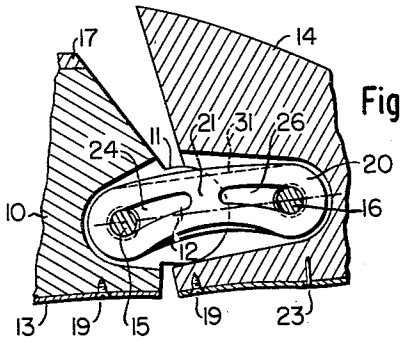


Fig. 3

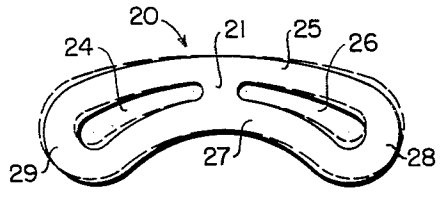


Fig. 5

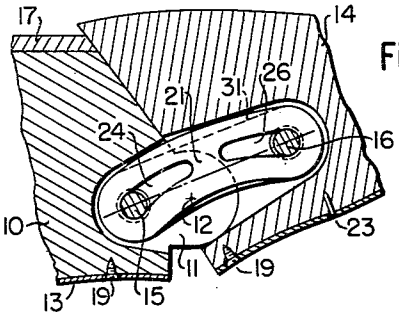


Fig. 4

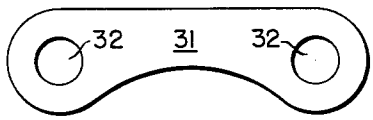


Fig. 6

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HINGED LAST

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5 Claims. (Cl. 12—136)

This invention relates to hinged lasts and consists in an improved link or hinge member constructed to perform the usual functions of keeping the toe and heel parts of the last together and of maintaining the last in either open or closed position. More specifically, this invention is an improvement of the invention disclosed in my prior Patent No. 2,188,414, issued January 30, 1940.

The object of my invention is to provide a more durable and efficient last by employing a novel link which requires the minimum amount of working space in the interior of the last parts and which securely holds the parts together against relative longitudinal displacement.

Many lasts as heretofore constructed have been unsatisfactory from the standpoint of durability because the extreme pressures encountered in the levelling, sole pressing, and cement sole attaching operations tend to break down the lasts in the areas where the parts have been weakened to provide working space for the hinge members which holds the last parts together. Furthermore the design of many links now in use is such that the links elongate and the parts of the last are permitted to separate to an objectionable extent under pressures ordinarily encountered in shoemaking operations.

An important advantage of my invention resides in the fact that my novel link may yield without danger of breaking and without permanent elongation and does not permit separation of the parts of the last except under extraordinary or abnormal pressures where a slight separation is permissible because it saves the wood and prevents breaking.

Although the objects and advantages outlined above are in general the same as those set forth in the above named prior patent, the invention presently to be described better performs its intended functions with substantially increased dependability. Of primary importance is the ability of the new link to withstand even greater pressures encountered normally or otherwise in shoemaking while consuming less space than the old link. Specifically, the improved link may be stamped from thinner metal stock which is correspondingly less expensive.

To accomplish the objects and secure all the advantages outlined above, I employ a link comprising one or more thin flat metal stampings formed as closed bodies wherein one side member is curved more than the other side member and a rigid cross rib connects the intermediate portion of each of said side members. The side members define two concentric arcuate slots circumferentially spaced by said rib. The extreme opposite ends of the slots are engaged by the usual anchor pins passing transversely through the heel and toe parts of the last. The anchor pins are so located that in their normal positions a line connecting their centers falls to one side of the axis of rotation of the two parts of the last, it being understood that the parts of the last are provided with interfitting curved surfaces to provide for relative rotation of the heel and toe parts about a fixed axis. As one part of the last is rotated about this axis the link is forced to lengthen in toggle action as the center line of the two anchor pins passes across the axis of rotation. After the center line has passed the axis of rotation tension on the link is relieved, although in closed position of the last the link is maintained under tension so that the two parts are held firmly in operative position. As the side of the link with the greater curve flexes, it is checked and guided by the relatively stiffer side with the lesser curve.

The brief description of the invention set forth in the next preceding paragraph may appear to be little more than a description of the invention disclosed in my above-named patent, with the addition of a rib interconnecting the side members of the link. The addition of the rib, however, produces the very desirable results listed above. Moreover, although the thickness of the link may be appreciably reduced by the addition of the rib, the flexibility of the link is not appreciably effected, for the presence of the rib compensates for the stiffness lost by the link's reduced thickness.

These and other objects, features and advantages of the invention will be more readily understood and appreciated from the following detailed description of a preferred embodiment thereof, selected for purposes of illustration, and shown in the accompanying drawing, in which:

Fig. 1 is a view in side elevation of a last in closed position with portions broken away to expose the connecting link construction,

Fig. 2 is a view in cross-section along the lines 2—2 of Fig. 1,

Figs. 3 and 4 are views in cross-section through the center of a last showing the parts in intermediate and collapsed position, respectively,

Fig. 5 is a view in side elevation of a link constructed in accordance with my invention showing in dotted lines its action under longitudinal tension, and

Fig. 6 is a view in side elevation of a spacer plate constructed in accordance with this invention.

As shown in Fig. 1, the last of my invention includes a heel part **10** provided with the usual comb plate **17** and a metal plate **13** secured to the last bottom by screws **19** and nails **23**. The heel part **10** is provided at its forward end with a hinge projection **11** of circular contour which extends transversely across the front of the heel part. The last also includes a toe part **14** provided at its rear end with a transverse concave depression into which the projection **11** fits closely so that the parts **10** and **14** may be relatively rotated upon the line **12** as an axis.

The heel part **11** is bored to receive an anchor pin **15** which is parallel to the line **12**, and the toe part **14** is provided with a similar anchor pin **16**. The pins **15** and **16** are so located that when the last is collapsed as shown in Fig. 4 or closed as shown in Fig. 1, a line connecting their centers falls to one side or the other of the axis of rotation represented by the line **12**.

The anchor pins **15** and **16** are connected by one or more links **20** illustrated in detail in Fig. 5. The link **20** may be stamped from any tough resilient metal, such as spring steel. The link comprises a pair of spaced apart elongated side members or glands **25** and **27** smoothly merging at their terminal portions into a pair of rounded ends **28** and **29**. The side members **25** and **27** are of substantially the same width but are otherwise of different configuration. The side member **25** is slightly curved while the member **27** defines a pronounced curve rendering the gap between said members non-uniform in width. Interconnecting the intermediate portion of each of the side members is a rib **21** which divides the space defined by the side members and ends into two similar slots **24**

and 26. The slots 24 and 26 are circumferentially spaced by the rib 21 and are of arcuate configuration due to the curvature of the side members 25 and 27.

Fig. 2 illustrates the use of a pair of links separated by a spacer plate 31. This laminated construction is desirable for it permits the use of very thin links thereby avoiding the difficulties encountered in the stamping of relatively thick links. The use of a single link, however, is not to be considered a departure from the spirit of this invention. The particular advantage derived from the use of the spacer 31 will be set forth later.

When the last is closed as illustrated in Fig. 1 the line connecting the centers of the anchor pins falls slightly below the axis of rotation 12 of the parts of the last. In the intermediate position illustrated in Fig. 3 the center line of the anchor pins intersects the axis 12 while in the collapsed position the center line is above the axis 12. The distance between the anchor pins 15 and 16 is the same except when they are in alignment with the axis of rotation of the last parts. However, when the axis 12 intersects the center line of the anchor pins, the distance between the pins is increased, and the links 20 must elongate in order to permit relative movement of the last parts. The last is thus locked in closed position and can only be broken when the toe portion is moving upwardly with sufficient force to elongate the link in carrying over the dead center.

It will be apparent from an inspection of Fig. 5 that the lower side member 27 of the link 20 is curved to permit lengthening under longitudinal tension. The substantially straight side member 25 and the rib 21 cooperate to act as a brace for the member 27, thus resisting the flexure of the link as a whole. In this manner flexure is substantially limited to the dotted line position illustrated. The rib 21 further prohibits appreciable increase or decrease in the width of the slots 24 and 26 and thereby prevents any binding of the link against the sides of the cavity in the heel or toe parts containing it, or on the anchor pins 15 and 16. The upper member 25 itself may be very slightly deflected in the elongating action of the links. The resilient tension thus created is such that the link 20 will snap the last either to closed or collapsed position when the parts are once forced past the dead center.

The presence of rib 21 permits the link to be stamped from thinner sheet metal while sufficient strength is maintained. Moreover, the midsection of the link which is subject to the greatest bending moment under the action of longitudinal tension and which ultimately proves to be the most vulnerable section of the link receives the greatest support from the rib 21.

Another important advantage is acquired through the presence of the link 21, that is, the thickness of the slot to be cut into the toe and heel parts of the last for receiving the links may be reduced. Since a minimum amount of wood is removed, the last is not seriously weakened as is the case where more bulky links are employed. Furthermore the slot in the heel part does not interfere with the screws 19 used to secure the metal heel plate 13 to the last bottom, a distinct advantage in the manufacture of lasts. As shown in Fig. 1 the butt of the toe part below the circular cut is perfectly solid and not interrupted to provide working space for the link 20.

The links are so dimensioned that the anchor pins 15 and 16 exert considerable pull tending at all times to distort the link 20 and to force the parts of the last together, a pull which resists the stresses ordinarily encountered in shoemaking operations. If excessive and extraordinary pressure is applied, the parts will separate slightly and yield so that there is little danger of breaking the wood of the last.

Additional strength is added by the spacer 31. Obviously any shearing forces exerted against the last will be readily opposed by the spacer plate. Not so obvious is the added strength given to the link by the spacer for opposing longitudinal tensions. The holes 32 which receive the pins 15 and 16 are enlarged and do not interfere with the relative movement of said pins under ordinary pressures encountered in shoemaking. However, should extraordinary pressures be applied to the last which otherwise would move the pins an appreciable distance beyond the margin of the slots 24 and 26 as illustrated in the dotted lines of Fig. 5, the outer margins of the holes 32 will bear against the extremes of the pins and further resist said movement.

It will be understood that the degree of curvature of the sides of the link is not critical, but that the one side must be curved more than the other so that it will flex more readily than the other if the desired advantages are to be secured. In links heretofore used it has been necessary to leave clearances so that the parts of the last could be rotated, with the result that when the last was in either normal position, the parts were loosely held together. The link of my invention, due to its self-contained spring action, holds the parts of the last tightly together at all times and in all relative positions of the parts of the last.

It will be understood that the links 20 are slightly elongated by tension at all times when the last is closed so that the parts are then held closely together. The links are further elongated as the parts of the last are rotated upon each other in passing over the dead center position.

I contemplate the use of either one or a plurality of links in a last, according to the size and weight of the last. Where a single link is used it may conveniently be formed of thicker metal than would be employed where a plurality of links are used.

The foregoing description relates to but one expression of the spirit of my invention and will serve as an illustration of a structure in which my invention can be visualized. However, my invention is limited neither by the materials mentioned in the description nor by the specific configuration of the elements shown in the drawing since there are many possible embodiments of my invention in which the shapes and materials of the elements and their relative locations may differ considerably from those specifically disclosed above. For example, the links may be inverted and still function equally as well as in the position shown in the drawing. The determination of the scope of my invention by means of the appended claims should be carried out with this paragraph in mind.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a last including toe and heel parts having interfitting curved surfaces to permit relative rotation of the parts about a fixed axis, a hinge comprising a single link of sheet steel provided with a pair of circumferentially spaced arcuate slots, the slots dividing the major portion of the link into a substantially straight side member, a flexible curved side member, and a rib interconnecting the intermediate portion of each of said side members.

2. In a last including toe and heel parts having interfitting curved surfaces to permit relative rotation of the parts about a fixed axis, a flat resilient sheet metal hinge comprising two longitudinal side members of substantially the same width integrally united at their ends and also at their midsections, one of said side members being slightly curved and the other of said side members having pronounced curvature, whereby the later side member is more flexible under tension than the less curved side member.

3. A last hinge link comprising a pair of sheet metal side members of substantially equal width and unequal curvature, said side members being integrally united at their ends, a rib interconnecting the midsections of each of said side members and defining with said side members a pair of circumferentially spaced arcuate slots.

4. A last hinge link comprising a pair of elongated

sheet metal side members of substantially equal width and unequal curvature separated by a gap, the gap separating said members being larger at its ends than at its intermediate portion, a pair of rounded end members interconnecting the terminal portions of side members and a rib interconnecting the midsections of said side members, whereby said side members, end members and rib form said gap into a pair of circumferentially spaced arcuate slots.

5. In a last including toe and heel parts having interfitting curved surfaces to permit relative rotation of the parts above a fixed axis, a hinge comprising a pair of flexible sheet metal links each having side members of

equal width and unequal curvature, a pair of end members integrally connecting the terminal portions of each of said side members, a rib connecting the intermediate portion of each of said side members, and a spacer plate operatively associated with said pair of links for limiting the stresses applied to said links by the toe and heel parts of the last.

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