Feb. 24, 1953

B. F. KELLS ET AL

2,629,487

BICYCLE WHEEL BRACE

Filed May 15, 1948

2 SHEETS—SHEET 1

Fig. 1.

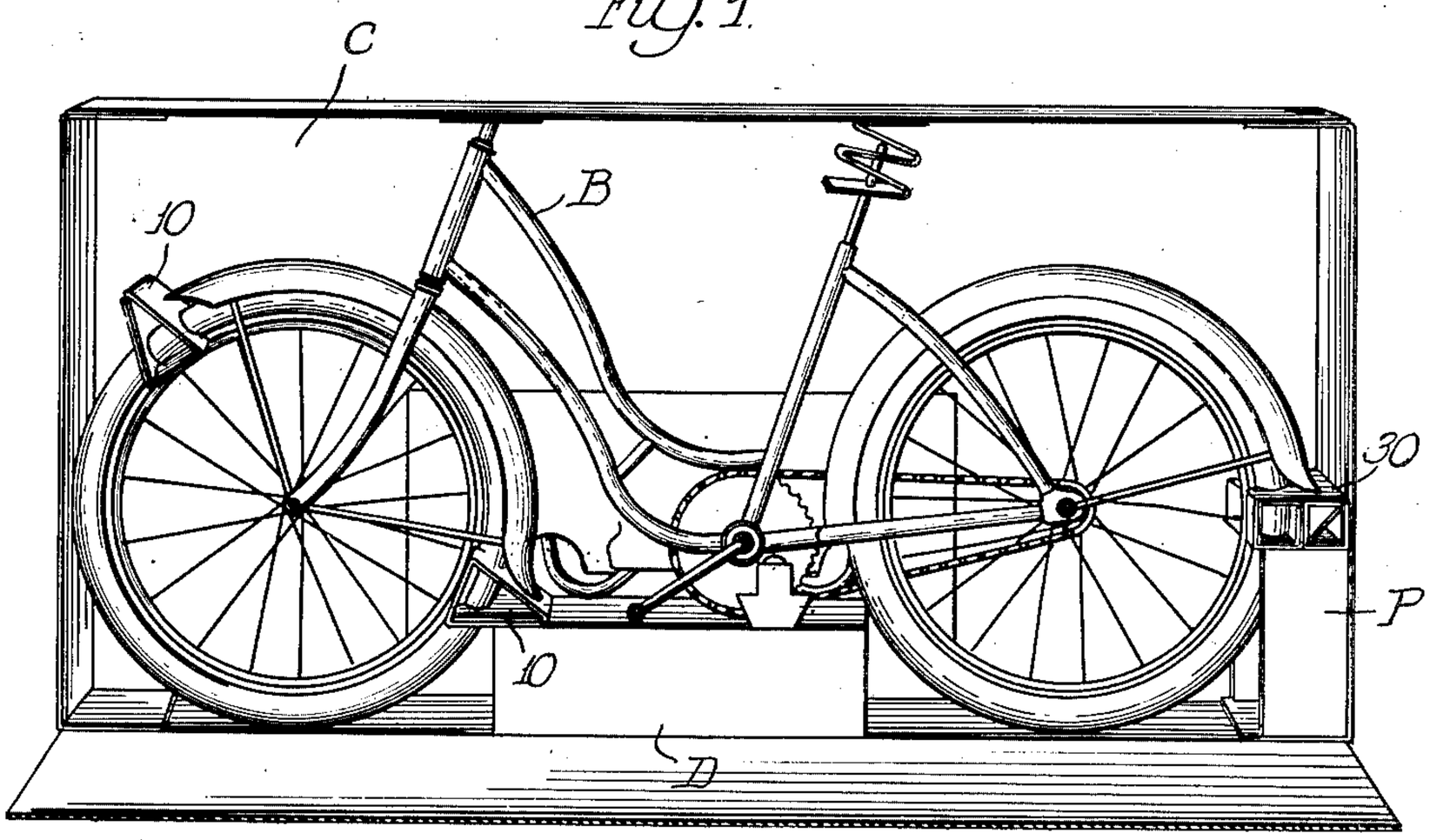


Fig. 2.

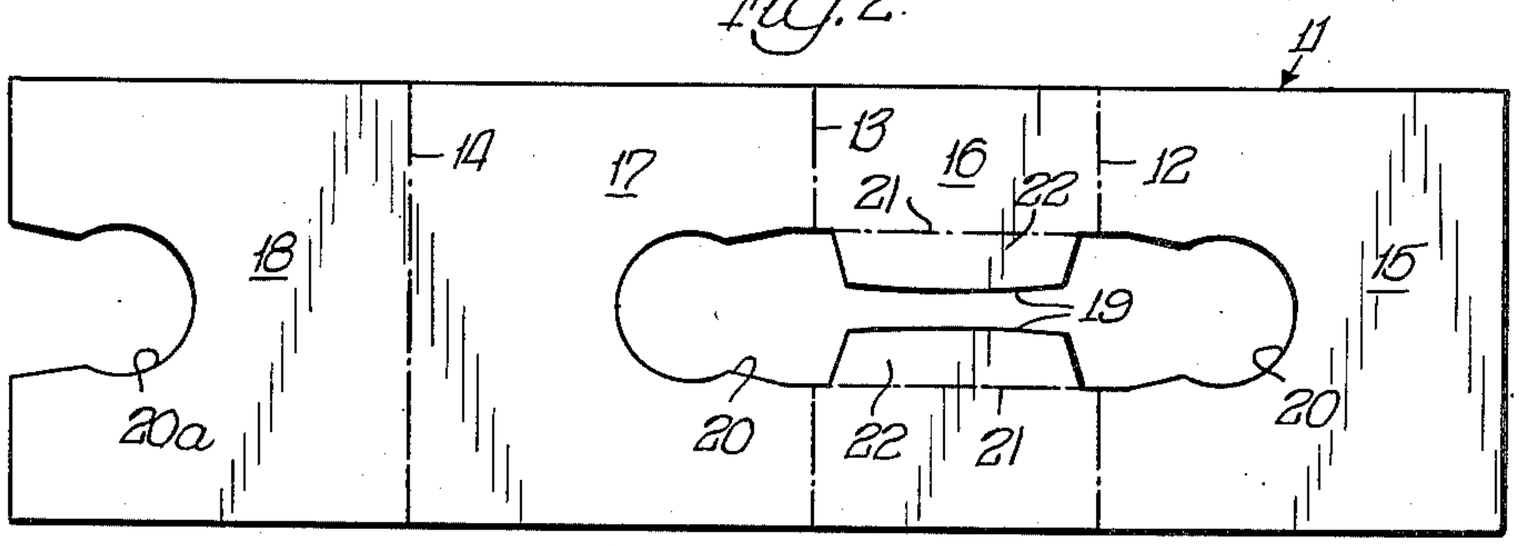


Fig. 3.

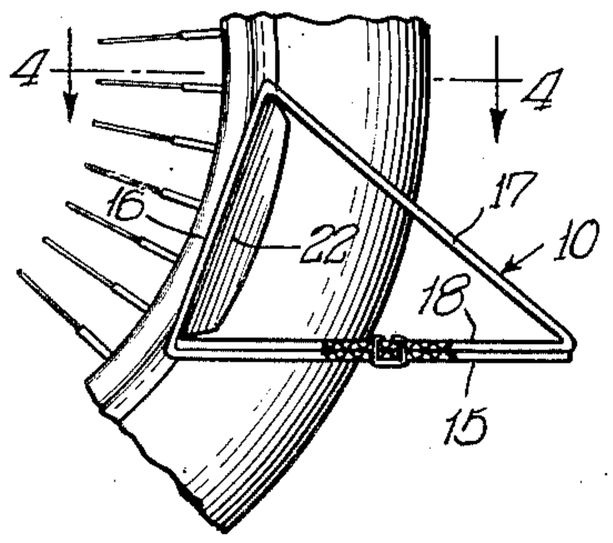
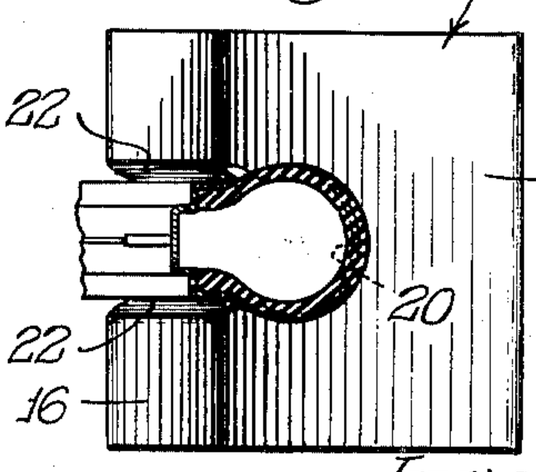


Fig. 4.



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Filed May 15, 1948 2 SHEETS—SHEET 2

Fig. 5

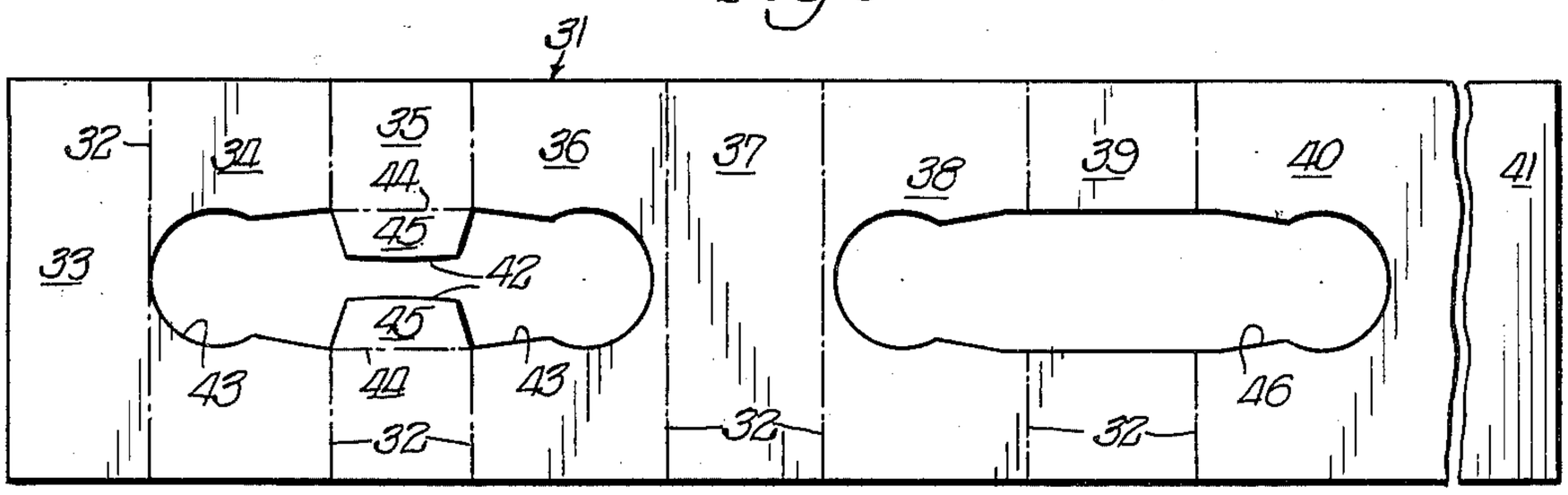


Fig. 6.

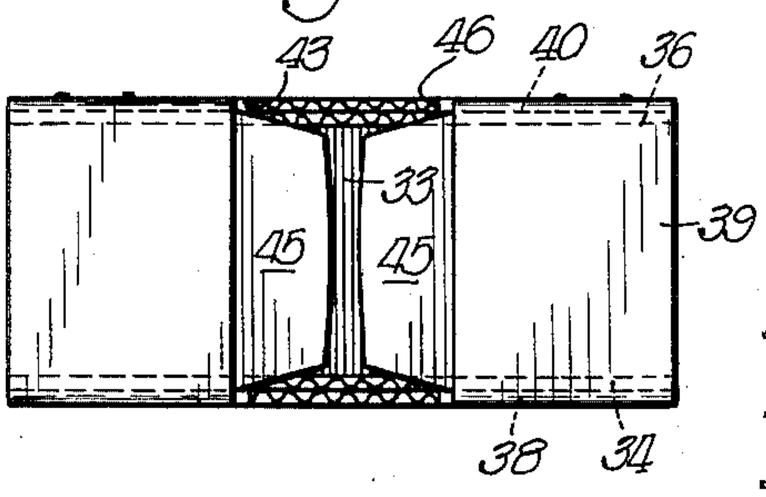
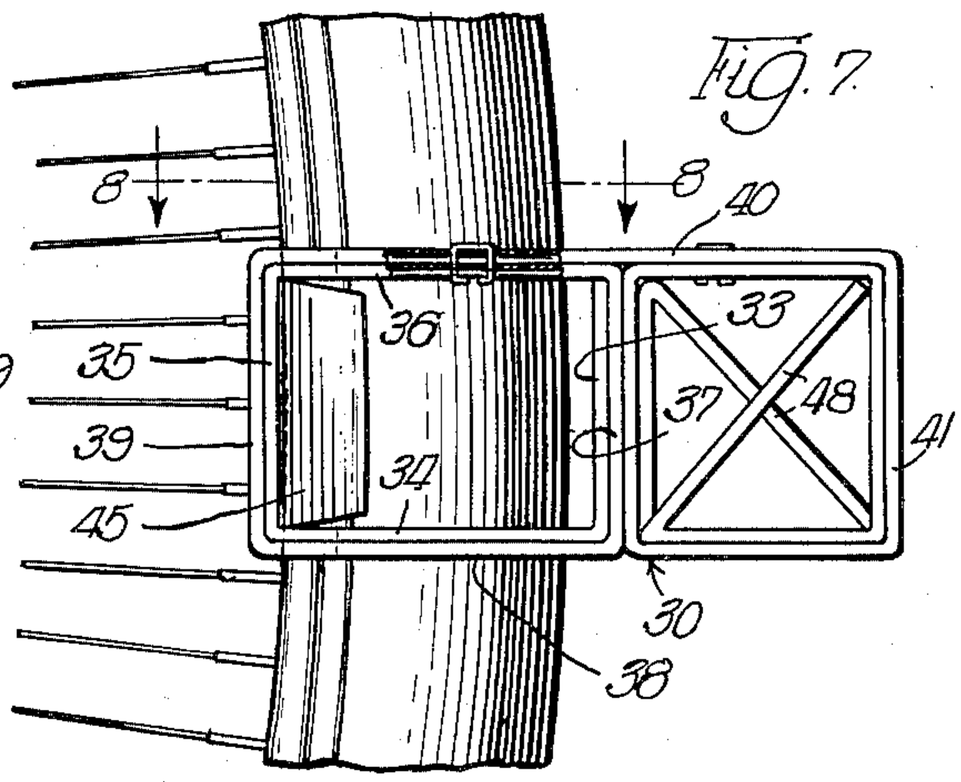


Fig. 7.



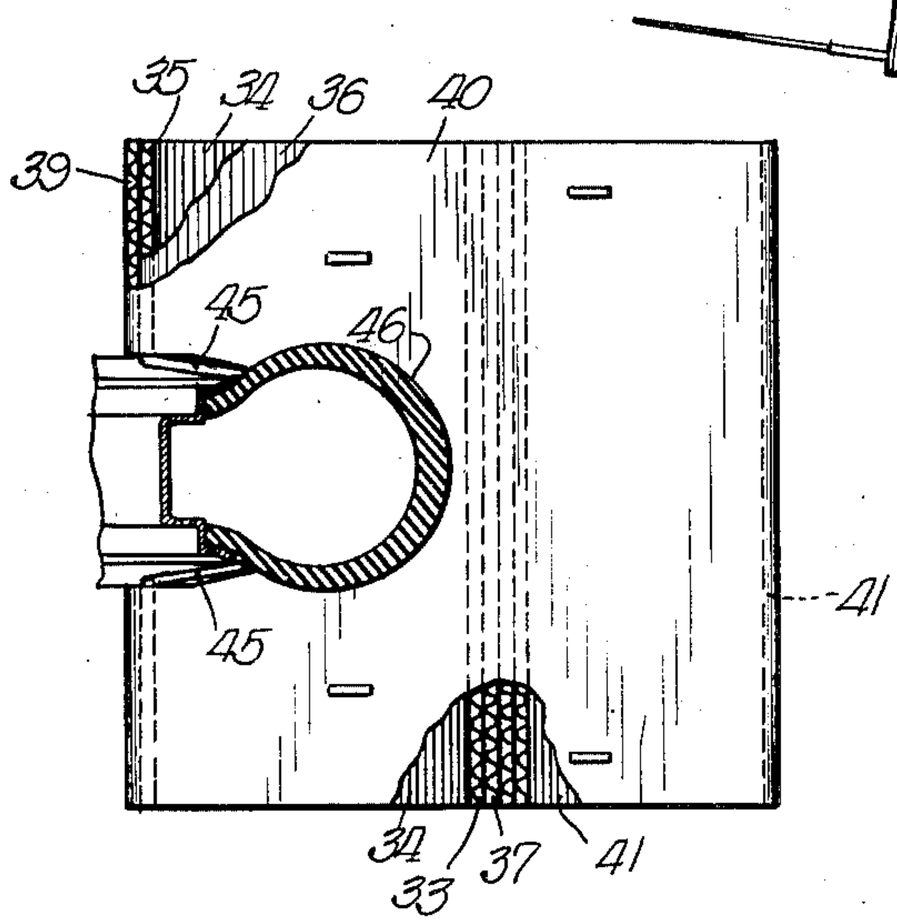


Fig. 8.

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UNITED STATES PATENT OFFICE

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BICYCLE WHEEL BRACE

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2 Claims. (Cl. 206—46)

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This invention relates to a packing brace of paperboard for holding an article against undesired movement in a container, and to a blank therefor. More particularly, the invention relates to a paperboard packing brace which may be thrust onto an article and automatically lock itself thereon against removal, and to a blank for such a brace. The brace of the invention is especially well adapted for use with tired wheels such as bicycle wheels, but is not limited to such use, since it may be adapted for packing a variety of other articles. In general, the brace is formed from an apertured paperboard blank which is folded and secured to define a substantially rigid hollow body which may be thrust onto the article or a convenient portion thereof. The article projects through the apertured portion of the brace, and locking flaps are provided on the aperture edges to engage the article and resist pulling off of the brace. These locking flaps are bent out of their original position by the article as the brace is placed thereon, and their tendency to return to such position by reason of the inherent resilience of the paperboard maintains them in engagement with the article. If the article to be packed has a bulged contour portion or projecting portions, the flaps abut such portions so as to prevent pulling the brace off the article. The brace may be so dimensioned as to engage the interior of the container for the article, and thus hold the article out of contact with the interior surfaces, or certain of them, or against undesired shifting in the container.

It is an object of our invention to provide a simple and easily formed brace of paperboard for holding a packed article against undesired movement in a container. It is another object to provide a paperboard packing brace readily attachable to an article to be packed in a container for preventing relative movement of the article and container. A further object is the provision of a paperboard packing brace which may be attached to an article merely by being thrust thereon, and which automatically locks itself on the article against removal therefrom. A still further object is the provision of a packing brace of hollow formation having apertured walls and locking flaps associated therewith to permit an article to extend into the brace and to lock the article and brace against separation. It is also an object to provide a one-piece paperboard blank for such a packing brace. Another object is to provide a brace blank of paperboard which is readily foldable from flat form to the set up brace form.

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Other and further objects and advantages of the present invention will be apparent to those skilled in the art from the following description and the appended drawings, in which:

Figure 1 is a perspective view of a partially assembled bicycle in a shipping container therefor, with two forms of the brace of this invention applied to the wheels thereof;

Figure 2 is a plan of the blank for one form of the brace;

Figure 3 is an enlarged fragmentary view of a portion of Figure 1;

Figure 4 is a sectional view taken substantially as indicated by the line 4—4 in Figure 3;

Figure 5 is a plan of the blank for another form of the brace;

Figure 6 is an end view of a brace formed from the blank of Figure 5;

Figure 7 is an enlarged, fragmentary view of another portion of Figure 1; and,

Figure 8 is a sectional view, with portions broken away, taken substantially as indicated by the line 8—8 of Figure 7.

Referring to Figure 1 of the drawings, a partially assembled bicycle B including the front and rear wheels is shown in a container C one main wall of which has been opened to show the packing arrangement. One form of the brace of this invention, designated by the numeral 10, is shown applied to the front wheel. In the figure, two of the braces 10 are shown on the front wheel, although it will be clear that fewer or more may be used as desired. One of the braces 10 is applied to the wheel immediately adjacent the front end of the fender or mud guard, and the other is applied at the lower and rear end of the mud guard. This latter brace may conveniently be held between the mud guard and an accessory box D or similar interior packing to prevent rotation of the wheel and to be held against movement out of its desired position by such rotation.

For convenience, the brace of this invention is illustrated and described as particularly adapted for and applied to bicycle wheels, since it has been found of great advantage and convenience in the packing of such wheels, especially in the shipment of partially assembled bicycles. We wish to make it clear, however, that the application of the invention is not limited to bicycle wheels, and that the principle of the invention is readily adaptable to numerous articles. It is therefore to be borne in mind that the brace of this invention is capable of a wide and general application in the packing of many types of articles.

Referring now to Figures 1 to 4 of the drawings, the brace **10** is formed by suitably folding the blank **11**, which comprises a flat oblong sheet of paperboard, preferably corrugated fibreboard, having transverse fold lines **12**, **13**, and **14**, such as score lines, to define an end panel **15**, an intermediate panel **16**, a third panel **17**, and an end securing panel **18**. The panels **15** and **17** are substantially identical in size and shape. The intermediate panel **16** is formed with a slot **19** extending thereacross from the panel **15** to the panel **17**. Each of panels **15** and **17** is provided with an aperture **20** having an open end at the panel edge adjacent the intermediate panel **16**, and communicating with the slot **19**. A pair of fold lines **21**, such as scores, extend between the corresponding edges of the open ends of the apertures **20**, and with the edges of the slot **19** define locking flaps **22** hinged to the panel **16** along the lines **21**. Instead of a single flap **22** along each side of the slot **19**, a plurality of such flaps or tabs may be provided.

The brace **10** is formed from the blank **11** by folding along the lines **12**, **13** and **14**, with the edges of the panels **15** and **17** remote from the panel **16** disposed adjacent each other, and the panel **18** overlapping the panel **15** and secured thereto by any suitable means, such as staples. The panel **18** is provided with an aperture **20***a* identical to the apertures **20**, and positioned so as to register with the aperture **20** of the panel **15** when the brace is formed from the blank as just described. The securing panel **18** is shown as almost the same size as panel **15**. It will be clear, however, that if desired the panel **18** might be made substantially smaller than the panel **15**, so that it would not extend to the aperture **20** of the panel **15** when the brace is formed, or might otherwise be formed to avoid the aperture **20**. It is thus within the purview of the invention to form the panel **18** as a relatively small connecting tab or flap between the panels **15** and **17**. Generally, however, it is more convenient in setting up the blank and securing the panels **15** and **18** to have them of substantially the same size, thus providing a greater area in which the securing means may be positioned. For example, in using staples to secure the brace in its formed condition, the central portion of the brace may receive the anvil portion of a stapling or stitching machine, while it might be impossible to position the anvil at either end of the panel **17** because of the proximity of other panels. The same advantage of greater working space is available with other securing means than staples, as will be obvious. The formation of the panel **18** substantially coextensive with the panel **15** has another advantage, in that the double thickness of material thus provided results in greater strength and rigidity of the brace. Of course, the walls of the brace may all be of double thickness, or more, if desired.

In folding the blank **11** to produce brace **10**, the panels of the blank are folded toward the same face of the blank along the fold lines, and the terminal panels are disposed in overlapping relation and secured together. That provides a closed polygon—a triangle—the walls of which are all secured together and are mutually reinforcing, and the base wall of which is the panel **16** provided with the slot **19** and tabs **22**, from the ends of which the apertures **20**

and **20***a* in the side walls extend toward the apex of the brace. The resultant brace **10** requires but a comparatively small amount of paper board in its construction, which is desirable for obvious reasons, while possessing adequate compressive strength for its intended use.

Since the invention is described and illustrated as embodied in a brace for application to bicycle wheels, the apertures **20** and **20***a* are shown as of substantially keyhole shape to correspond generally to the cross-sectional contour of the tire and rim of such a wheel. In practice, the slot **19** and apertures **20** are formed as a single slot or aperture extending across the edges of adjacent panels. The open ends of the apertures **20** and **20***a* are slightly wider than the rim portion of the wheel and converge in the direction of the rounded portion of the apertures, which, of course, corresponds to the cross-sectional shape of the tire portion outside of the rim. The free edges of flaps **22** are curved to correspond substantially to the curvature of the tire adjacent the edges of the rim, and are of a width such that they engage against the tire adjacent the rim edges. It will be clear that the particular dimensions and shapes of the slot **19** and apertures **20** and **20***a* may be varied as necessary or desirable for application to articles of different cross-sectional contours.

In applying the brace to a bicycle wheel, it is grasped at the juncture of the panels **15** and **17** with the center line of slot **19** disposed in the radial plane of the tire, and moved radially inwardly of the tire and wheel until the tire engages in the rounded portion of the apertures **20** and **20***a*. The flaps **22** are spread apart by the tire with their free edges directed radially outwardly. As the flaps **22** pass radially inwardly past the widest portion of the tire, the resilience of the paperboard results in their tending to spring toward each other, so that they continue in engagement with the outer surface of the tire as the brace is moved radially inwardly. When the brace is seated on the tire and rim, the flaps **22** are disposed with their edges abutting against the tire, radially inward of the widest or bulged portion of the tire at such an angle that they can not slip radially outwardly along the surface of the tire if the brace is pulled outwardly, and are held at this angle and against further movement toward each other by the intervention of the rim between them. This is clearly shown in Figures 3 and 4. The flaps therefore cannot swing about their hinges in response to attempted radially outward movement of the brace, and thus prevent such movement. The opposed side walls of the tire, bulging outwardly, serve as lateral projections behind which the flaps engage. The brace is so dimensioned that the lateral edges of the panels engage against the opposed main side walls of the container C so that the wheel and its associated parts are held against moving axially, and thus maintained out of contact with the opposed side walls of the container. The brace of course may also be so dimensioned as to hold the wheel against contact with the end walls or the top and bottom walls of the container.

Another form of the brace, designated by the reference numeral **30**, also described as applied to a bicycle wheel, is shown generally as applied to the rear wheel in Figure 1 and is shown

in detail in Figures 5 to 8. In this form, a reinforcing and spacing structure is incorporated in the brace. This form of the bicycle wheel brace is particularly adapted to be used on the rear wheels of partially assembled bicycles, since they are ordinarily shipped with the rear wheel lowermost. A brace to protect the rear wheel must therefore be capable of sustaining the weight of the partially assembled bicycle. The brace 30 is disposed on the rear wheel substantially in the horizontal axial plane thereof, and directly below the rear end of the fender or mudguard. The brace is thus in a good position to support the weight of the bicycle when the container is upended. To hold the brace in this position, suitable interior packing, such as the pedestal P extending from the bottom of the container C to the brace, may be provided. The brace 30 is thus held between the mudguard and packing. Of course, other means may be used to maintain the brace in the desired position.

The brace 30 is formed from the oblong blank 31 shown in Figure 5. This blank has fold lines 32, which like the fold lines 12, 13 and 14 of the blank 11 described above may be scored lines, to define an end panel 33, a first apertured panel 34, an intermediate apertured panel 35, a second apertured panel 36, an outer end panel 37, additional outer panels 38, 39 and 40, as well as an end portion 41 which may be employed as a reenforcing and spacing means for the brace proper, as by folding this end portion in any suitable manner. A slot 42 similar to the slot 19 of the previously described brace 10 extends across the intermediate panel 35, and an aperture 43 of generally keyhole shape and communicating with the adjacent end of the slot 42 is formed in each of the panels 34 and 36. Fold lines 44 extend between the corresponding ends of the apertures 43 and with the sides of the slot 42 define the locking flaps 45 which hinge on the panel 35 along the lines 44. Each flap 45 may be replaced by a plurality of tabs or flaps if desired. A slot or aperture 46 is formed in the panels 38, 39 and 40 of the same general size and shape as the aperture defined in the panels 34, 35 and 36 when the flaps 45 are bent out of the plane of the panel 35.

The brace 30 is formed by folding the blank 31 on the lines 32 so that the end panel 33 is opposite and parallel to the panel 35, and the panels 34 and 36 extend between the panels 33 and 35 in parallel relation to each other. The panels 37, 38, 39 and 40 overlie the panels 33, 34, 35 and 36 respectively, with the aperture 46 registering with the apertures 43 and the opening in the panel 35 defined by the lines 44 when the flaps 45 are bent out of the plane of that panel. This provides a securing portion for the brace of double thickness throughout, providing greater strength than if only a single thickness of material were employed. The panels are of slightly differing widths, in order to allow for the thickness of the material in making the bends in the blanks, in a manner well known in the art and which need not be particularly described here. The end panel 33 serves as a spacing and reenforcing means between the panels 34 and 36, and the outer end panel 37 similarly serves between the panels 38 and 40. The panel 40 is considerably wider than the panels 34, 36 or 38, so that it may extend beyond the panel 36 which it overlies

and serve as a connection between the securing portion of the brace and the reenforcing and spacing portion provided by the end portion 41 of the blank.

The brace 30 of Figure 7, like the brace 10 of Figure 3, is in the form of a closed polygon—a rectangle—the walls of which are secured together and are mutually reenforcing. It has a base wall, comprising the panels 35 and 39, provided with a slot 42 and holding flaps or tabs 45, from the ends of which the openings 43 and 46 in the side walls extend away from the base and toward the opposite side of the brace. The brace 30 requires but a comparatively small amount of paper board in its construction while possessing adequate compressive strength for its intended use.

It will be clear that by folding the end portion 41 of the blank so as to provide a multiple thickness of material, whether this be in the form of a hollow body or as a substantially solid body comprised of a plurality of layers of paperboard, a very strong brace is provided capable of supporting a very considerable weight. The inclusion of such a reenforcing spacing member in the brace 30, together with the additional strength provided in the securing portion of the brace by the double thickness material, results in the desired strength. Of course, the brace 30 may be formed with only a single thickness of material in the securing portion provided by the panels 33, 34, 35 and 36, and the panel 36 might then be employed as a connection between the securing portion and the reenforcing portion formed of the end portion 41 of the blank. Any suitable securing means might be employed in this lighter construction, such as a connecting tab, flap, or panel extending from the panel 33 and secured to the panel 36, similar to the panel 18 described in connection with the first form of the brace. Similarly, the reenforcing portion formed of the end portion 41 of the blank might be of only a single thickness of material, if that should be desirable, depending upon the strength required in the particular brace.

A brace 30 formed from the blank 31 is shown in Figure 7 secured on the rear wheel of a bicycle. The crossing interior bracing elements 48 shown in Figure 7, however, are provided by forming the end portion 41 of the blank 31 in a special manner. This particular construction does not form a part of the present invention and is illustrated only as an example of how the end portion 41 of the blank may be folded and formed to provide a strong reenforcing portion for the brace 30. As already mentioned above, the end portion of the blank may be folded or otherwise formed in any desired manner to provide the desired strength and resistance to crushing under load.

The brace 30 is applied to the wheel in the same manner as the brace 10, the flaps 45 of the panel 35 engaging against the edges of the wheel rim and having their free edges abutting against the tire adjacent the rim edges at such an angle as to resist radially outward movement of the brace, while the rounded portions of the apertures 43 and 46 engage the tire to prevent additional radially inward movement of the brace once the brace has been properly seated on the tire and rim. This locking of the brace on the wheel is perhaps best shown in Figure 8, although it is also apparent from Figure 7.

The brace 30, like the brace 10 previously described, may of course be adapted for application to other articles than bicycle wheels and the like, and since the necessary changes in the brace as

described in order to adapt it for use on other articles will be obvious to those skilled in the art, no detailed description of the various changes which might be made to adapt it to any other articles is attempted here.

It will be noted that the brace 10, comprising three main panels, is triangular in cross section, while the brace 30 is provided with four walls, and is of rectangular cross section. The walls of either form may consist of more than one thickness of material. Furthermore, the triangular form of the brace embodied in the brace 10 and the rectangular form as illustrated by the brace 30 might be varied to include other cross sectional outlines, so long as the necessary rigidity and strength were maintained. Such changes would merely alter the specific form of the brace, without departing from the principle of the invention.

Other variations in the particular details of the brace may of course be made. For example, the article-receiving aperture or slot may lie in only two of the panels, with the locking flaps extending from one or both panels adjacent the fold line therebetween, more or less at the central portion of the slot.

Since it is clear that many changes and modifications may be made in the disclosed embodiments of the invention without departing from the principles thereof, some of which have been suggested in the disclosure, it is not intended that the invention be limited otherwise than as required by the spirit and scope of the appended claims.

We claim:

1. A paperboard packing brace for use in packing for shipment bicycles and the like having wheels with tires mounted thereon, a plurality of panels secured together end to end and defining a closed polygon having a base panel of substantial width and side panels extending from the ends of the base panel and spaced apart thereby at their ends adjacent said base panel, the latter having a slot extending the full width thereof and locking flaps hinged thereto along fold lines substantially coincident with the sides of said slot, the latter being of substantially uniform width and said flaps being of substantially equal width, the combined widths of said flaps being within the width of said slot, each of said side panels

having therein a key-hole aperture aligned with said slot and comprising an outer substantially semicircular portion of a diameter approximately the same as the width of said slot and an inner portion of approximately the same width at its inner end as said slot and converging therefrom outwardly and opening into said outer portion.

2. A paperboard packing brace for use in packing for shipment bicycles and the like having wheels with tires mounted thereon, a plurality of panels secured together end to end and defining a closed triangle having a base panel of substantial width and side panels extending from the ends of the base panel and spaced apart thereby at their ends adjacent said base panel, the latter having a slot extending the full width thereof and locking flaps hinged thereto along fold lines substantially coincident with the sides of said slot, the latter being of substantially uniform width and said flaps being of substantially equal width, the combined widths of said flaps being within the width of said slot, the free side edge of each of said locking flaps being convexly curved away from the fold line thereof, each of said side panels having therein a key-hole aperture aligned with said slot and comprising an outer substantially semicircular portion of a diameter approximately the same as the width of said slot and an inner portion of approximately the same width at its inner end as said slot and converging therefrom outwardly and opening into said outer portion.

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