April 11, 1967 L. R. BEYER 3,313,304

BINDER

Filed May 4, 1966

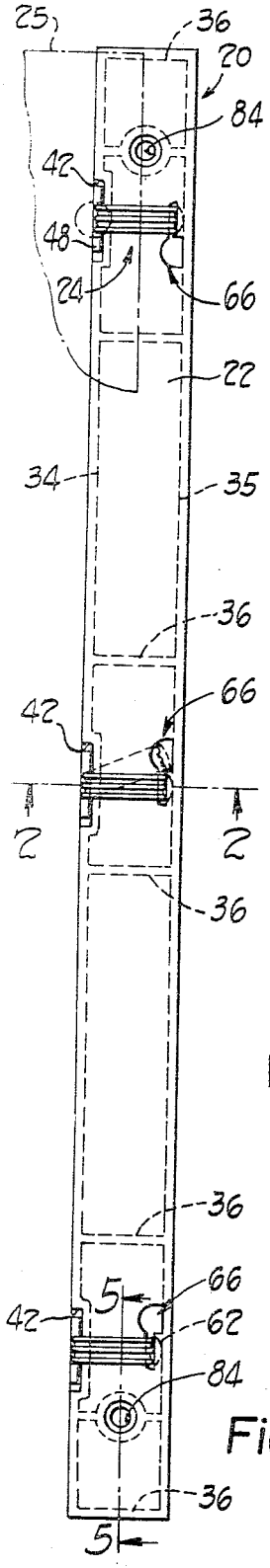


Fig. 1

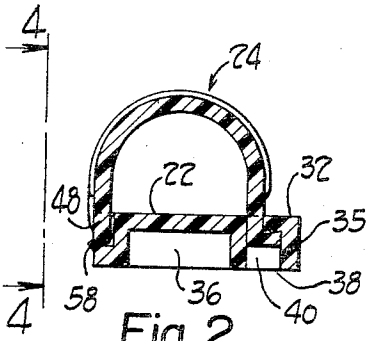


Fig. 2

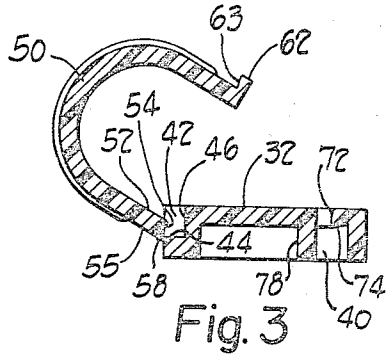


Fig. 3

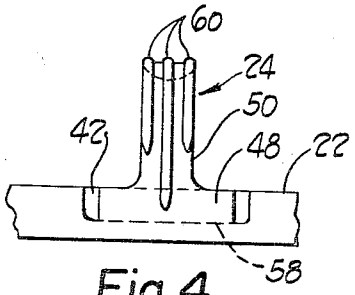


Fig. 4

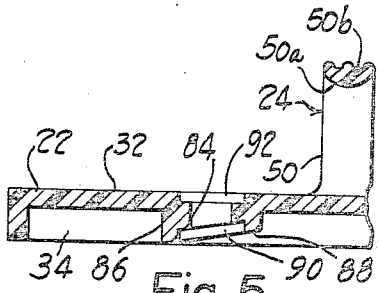


Fig. 5

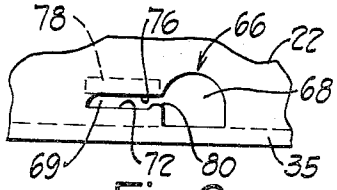


Fig. 6

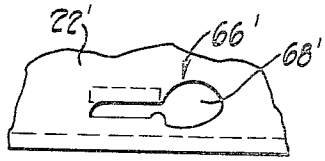


Fig. 7

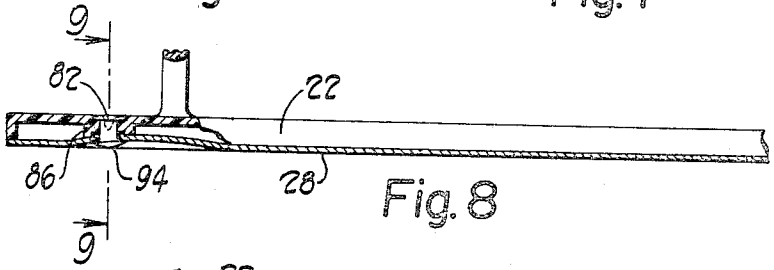


Fig. 8

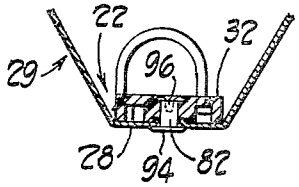


Fig. 9

INVENTOR.
LEWIS R. BEYER

BY

Watts & Fisher

ATTORNEYS.

United States Patent Office

3,313,304
Patented Apr. 11, 1967

3,313,304

BINDER

Lewis R. Beyer, 1853 Huntington Circle, Brunswick, Ohio 44212

Filed May 4, 1966, Ser. No. 547,669
7 Claims. (Cl. 129—24)

This application is a continuation-in-part of my copending application Ser. No. 416,362, filed Dec. 7, 1964, and entitled, "Binder."

The present invention relates to binders and more particularly to a ring binder of an economical construction, that is convenient to use and which can easily be applied to folders and other light covers to provide a low cost binder cover for supporting perforated sheets.

Millions of binders and covers are used each year as advertising brochure covers for supporting product specification and description sheets. The main attributes required in binders for such uses are ease and convenience in assembly and use, durability, and most important, economy.

In the above mentioned copending application, a ring binder assembly is disclosed and claimed in which binder ring elements are integrally formed with a back plate so that the entire ring binder can be made as a single piece member. The ring binder assembly is normally fastened to a binder cover. The binder ring elements are flexible fingers which project in a curved manner from one longitudinal side of the back plate to their free ends, and which are movable longitudinally and laterally, relative to the back plate. The other longitudinal side of the back plate and the free ring ends include interlocking portions for selectively securing the free ends of the binder ring elements to the back plate to close the ring binder assembly. The construction and arrangement therein provided overcame many disadvantages of known low cost binders, such as those that use bendable prongs, separate ring elements, separate rings, or rings that lack suitable locking arrangements to prevent them from becoming unlatched inadvertently. In its preferred form, the above described ring binder assembly is formed economically from a suitable synthetic plastic material by an injection molding technique.

The present invention embodies the various advantages and improved features of the ring binder disclosed and claimed in the above identified application, while yet providing additional advantageous features that greatly improve the functioning and durability of the ring binder.

One principal feature of the present invention is an improved construction of the binder ring elements and back plate of the ring binder. This improved construction utilizes recesses formed in a longitudinally extending edge of the back plate, at the locations where the binder ring elements, or fingers, are secured. The ring elements are integrally formed with the back wall. Narrow, elongated extending finger portions are connected at recesses by flexible hinge portions. Each hinge portion is located beneath the upper surface of the back plate and above the lower surface. When a ring element is in a closed position, a base portion lies within a recess and the finger forms a loop with the base plate. The hinge location and recess construction permit each binder ring element to swing open without interference from the binder cover. When closed, the ring element base is inset, flush with the side of the back wall, to provide an essentially flat longitudinal edge surface.

Each binder ring element is provided with a wide base portion adjacent the hinge. The width of the base portion and length of the hinge, relative to the finger portion width, are significant. The width of the base portion and the length of the hinge serve several important functions:

(1) The base is wide enough to stabilize the hinge portion of the binder ring element against twisting from forces applied to the elongated finger portion. (2) The hinge is of sufficient length to securely connect the ring element to the base plate. (3) The hinge length is restricted to a value, relative to the finger width, at which the hinge retains its flexibility with respect to the stiffness of the finger portion of the binder ring element. That is, the hinge portion is kept short enough that it is more flexible than the narrower but thicker finger portion. As a result, the hinge and not the finger portion flexes. (4) The absolute width of the base portion is greater than one quarter inch to prevent sheets having standard size holes from sliding down to the hinge portion of the binder ring, where the sheets could become pinched between the binder ring and the back plate.

Another important feature of the invention is the thickness of the integral hinge portion connecting the wider base portion of the binder ring with the back plate. The thickness of the hinge must be controlled within definite limits. To provide sufficient strength to securely connect the binder fingers to the back plate while yet providing flexibility, the base portion of each binder finger is connected to the back plate at a juncture that is controlled in thickness to between 0.010 and 0.020 inch. It will be appreciated that control of this feature within the defined limits, which are primarily dictated by the characteristics of the material of which the ring binder is made, determines the flexibility of the hinge portion for any given hinge length. The flexibility of the hinge, the actual length of the hinge, and the relative length of the hinge to the width of the finger portion of the binder ring element are all selected to provide desired functional characteristics of the hinge and finger in this invention.

All parts of the present ring binder are integrally formed of a suitable synthetic plastic material by an injection molding technique. It has been discovered that a linear polyethylene plastic of the type sold by The Dow Corning Corp. under the designation S–80 provides the necessary toughness and flexibility while yet overcoming some of the disadvantageous features of other known plastic materials. In particular, the present material overcomes several disadvantages inherent in the use of polypropylene. That material, while being very flexible, is brittle under sudden impact, and particularly in cold weather. Thus, binder rings of polypropylene might shatter if not handled carefully during shipment. For example, polypropylene binder rings in covers have been known to shatter from the impact resulting from a dropped carton of binder rings. Disadvantages of polypropylene for the purpose of forming a binder ring assembly have been overcome by the use of linear polyethylene.

The finger portions of the binder ring elements have been constructed to provide a high degree of rigidity, notwithstanding the inherent flexibility of the plastic material used. Three longitudinal ribs have been provided along the length of each finger and the ribs have been contoured to have a rounded outer shape. Two ribs are contiguous with the longitudinal side edges of each finger. These ribs form rounded or beaded edges that minimizes cutting or tearing of bound sheets at the punched holes, through which the fingers extend. The inwardly facing surfaces of the fingers are smooth and convexly curved to provide contact along a substantial portion of the curved periphery of holes punched in sheets mounted in the binders. Projections at the free ends of each binder finger are also rounded in contour so as not to catch on the holes of sheets used with the binder rings. These combined features provide binder fingers that function easily and smoothly without damaging or catching sheets during insertion of such sheets or during use after binding.

A further important feature of this invention relates to the construction of two bores positioned at each end of the back plate of the binder assembly. For convenience and economy, the back plates are riveted to the backs of folders at two spaced locations, adjacent the ends of the back plate. Bores through the back plate facilitate the rivets, which are punched through the folder and upset or swaged at the top surface of the back plate within the folder. One problem in the past has been a tendency for the somewhat flexible back plate to lift or bow away from the back of the folder at the central portion of the back plate. This tendency has essentially been overcome in the present arrangement by beveling a bottom surface of the back plate at areas surrounding the through-bores to provide lower surfaces that are inclined upward and toward the center of the back plate. As a result, when the back plate is riveted in place, the rivets and folder cooperate with the beveled surfaces to bias the central portion of back plate into close contact with the back of the folder. Counterbores are provided in the beveled surfaces surrounding the through-bores to receive any burrs from the material of the folder about the rivet. Such burrs would otherwise prevent close contact between the back plate and the folder. This further minimizes any space or gap between the back plate and the folder.

Accordingly, the objects of this invention are to provide a novel ring binder with a back plate and integral binder fingers of improved construction.

These and other objects, features and advantages of this invention will become better understood by reference to the following detailed description, when considered in conjunction with the accompanying drawings, in which:

FIGURE 1 is a top plan view of a ring binder constructed in accordance with the present invention;

FIGURE 2 is a transverse sectional view of the ring binder of FIGURE 1, taken along the line 2—2 and looking in the direction of the arrows, showing a binder finger in closed position;

FIGURE 3 is a transverse cross sectional view of the binder of FIGURE 1, similar to FIGURE 2, showing a binder ring in open condition;

FIGURE 4 is a partial side elevational view of the ring binder, taken along the line 4—4 in FIGURE 2, and looking in the direction of the arrows;

FIGURE 5 is a partial longitudinal sectional view of the ring binder of FIGURE 1, taken along the line 5—5 and looking in the direction of the arrows;

FIGURE 6 is a plan view of a fragmentary portion of the ring binder of FIGURE 1, showing on enlarged scale an opening for receiving and interlocking a free end of a ring binder finger;

FIGURE 7 is a view similar to FIGURE 6, showing another embodiment of an opening for receiving and locking a free end of a ring binder finger;

FIGURE 8 is a fragmentary side elevational view of the ring binder of FIGURE 1, with parts in section, showing the manner in which a beveled portion of the bottom surface of the back plate biases the central portion of the back plate and the back wall of a cover into close juxtaposition; and

FIGURE 9 is a transverse sectional view taken along the line 9—9 of FIGURE 8, and looking in the direction of the arrows.

Referring now to the drawings, a ring binder 20 is shown in the form of a one-piece integral unit formed of linear polyethylene. The ring binder 20 consists essentially of (1) an elongated back plate 22 constructed to be attached to the inside back of a binder cover, and (2) binder ring elements 24 integral with the back plate and constructed to pass through punched holes in sheets and to thereby bind the sheets within the binder cover. A corner of a sheet 25 secured by a ring element 24 is illustrated in phantom in FIGURE 1.

The back plate 22 is formed to fit against the inside back 28 of a binder cover 29. See FIGURE 9. The back

plate has a top or upper surface 32 that faces away from the back 28 of the binder cover 29, in the direction the binder ring elements 24 extend. The top surface 32 is spaced from the back 28 of the binder cover by two longitudinal walls 34, 35 along opposite longitudinal side edges of the back plate 22, and by transverse walls 36 beneath the back plate 22, between the longitudinal side walls 34, 35. The lower edges of the longitudinal side walls and the transverse walls form a bottom surface 38 of the binder ring. The walls 34, 35, 36 space the top surface 32 from the back 28 of the binder cover to provide open spaces 40 beneath the top. These spaces allow room for the ends of binder ring elements 24 beneath the top surface 32 when the rings are in a closed position.

The edge of the back plate 22 along the longitudinal side wall 34 includes three spaced recesses 42. As best illustrated in FIGURE 1, the recesses 42 are relatively short with respect to the length of the back plate 22 and extend only a short distance across the width of the back plate. As best shown in FIGURE 4, the depth of the recesses 42 is less than the thickness of the back plate; that is, less than the height of the side wall 34. The cavities 42, then, form steps in the top surface 32 and side edge along side wall 34 of the back plate 22. Each of these steps is formed with a bottom surface 44 and side surface 46. See FIGURE 3.

Each binder ring element 24 includes a wide base portion 48 that fits within a recess 42. The binder ring element also includes a narrow finger portion 50 that is integral with and extends from a central portion of the base. Preferably, the finger portion is curved, as shown in FIGURES 2 and 3.

The wide base portion 48 is of the same thickness as the finger portion 50, as can be seen from FIGURES 2 and 3. The base is formed with a flat inner surface 52, a flat bottom surface 54 and a flat outer surface 55. As best shown in FIGURES 2 and 3, the thickness of the base portion 48 is substantially the same as the depth of the step or recess 42 along the bottom surface 44. The width of the base portion 48, as best shown in FIGURE 4, is somewhat less than the length of the recess 42. The height of the base portion 48 is essentially equal to the height of the side surface 46 so that the wide portion is flush with the top surface 32 of the back plate. The lower edge of the base portion 48 formed by the juncture of the outer surface 55 and the lower surface 54 is integral with the back plate at the outer edge of the step or recess 42. A thin connecting portion 58 forms a flexible hinge so that the binder ring element 24 can pivot about the thin connecting portion.

The actual and relative dimensions of the base portion 48, the narrow finger portion 50 and the hinge 58 are important for optimum performance. Thus, the thickness of the hinge 58 should be between 0.010 and 0.020 inch, and preferably 0.018 inch. The length of the hinge 58 is essentially identical to the length of the wide base portion 48 in the preferred embodiment shown. If desired, the base portion can be wider than the length of the hinge.

The force needed to flex the hinge 58 is directly proportional to the length of the hinge. Similarly, the rigidity of the finger portion 50 of the binder ring elements 24 is directly proportional to the finger width, for any given thickness. When the finger width is at least one-third of the width of the hinge 58, there is sufficient rigidity in the finger portion to cause the hinge 58 to flex when the free end of the binder ring element is moved. On the other hand, the width of the wide base portion 48 should be at least twice as wide as the narrow finger portion 50 to stabilize the position of the binder ring element and to inhibit twisting of the base portion of the binder ring element, which tends to tear the hinge 58. It has been found convenient and advantageous to provide a hinge along the entire width of the base portion, making both of them between two and three times the width of the finger portion, preferably 2½ times the width.

It will be appreciated that the width of the narrow finger portion **50** can be no larger than the diameter of a standard hole provided in sheets to be mounted in the binder. At the same time, it is advantageous to provide a wide base portion, wider than the diameter of the standard size holes, to prevent the papers from riding down the binder ring elements to the hinge **58**, where they can be caught. This is prevented by making the width of base portion **48** greater than ¼-inch. In the preferred construction, the base portion is one-half inch wide.

The narrow finger portion **50** of the binder ring elements **24** is formed with an inside surface **50***a* curved in cross section, as best shown in FIGURE 5. Preferably, the curvature is formed to a radius of ¼-inch to provide substantial contact with the periphery of the standard size holes of the sheets to be secured in the binder. An outer surface **50***b* includes three spaced longitudinally extending reinforcing ribs **60**. These ribs **60** provide stiffness to the finger portion **50**, to help retain it in a preformed curved configuration. The outer surfaces of the ribs **60** are rounded. Two of the ribs extend contiguously with the two longitudinal edges of the finger portion **50** and provide rounded or beaded edges that protect the peripheries of the holes of sheets secured in the binder. This construction of the finger portions greatly facilitates the turning of pages within the binder without catching the pages and without tearing them.

An end projection **62** extends outwardly from the free end of the narrow finger portion **50** and has a top inclined surface **63**, as best shown in FIGURE 3. The end projection **62** engages with a portion of the back plate **22**, in a manner to be described subsequently. The outer periphery of the end projection **62** is curved as shown in FIGURE 1, so that there are no sharp corners to catch the periphery of holes in sheets that are slipped over the ends of the finger portions **50**.

Three spaced apertures **66** are formed in the back plate **22** along the side edge adjacent the longitudinal side wall **35**. An aperture **66** is shown in detail in FIGURE 6. Each aperture **66** includes a large entrance portion **68** and a narrow locking portion **69**. The narrow locking portion **69** is directly opposite the center of the base portion of an associated binder ring element **24**. The entrance portion **68** is longitudinally offset from the center of the base portion of the binder ring element. As shown in FIGURE 1, two of the entrance portions **68** of the apertures **66** are offset in a common direction from the base portion of the associated ring element while the entrance portion of a third aperture **66** is offset in an opposite direction. This prevents sheets carried by the binder ring elements from shifting longitudinally of the back plate and moving all three binder ring elements from the locking portions of the apertures to the entrance portions.

The entrance portion **68** of each aperture **66** is large enough to receive the free end of the finger portion **50** of the associated finger binder ring element, including the end projection **62**. The narrow locking portion **69** is of a width transversely of the back plate **22** sufficient to accommodate only the thickness of the narrow finger portion **50** of the binder ring element **24**. An outer edge or peripheral portion **72** of the narrow locking portion **69** is spaced inwardly from the longitudinal side wall **35** a distance essentially equal to the depth of the inclined surface **63** of the end projection **62**. The lower surface **74** of the back plate **22** between the peripheral portion **72** and the side wall **35** is inclined, as illustrated in FIGURE 3, complementary to the inclined surface **63** of the end projection **62**.

A peripheral portion **76** of the locking portion of the aperture **66** is flush with a depending stop plate **78**. The plate **78** is adapted to abut the inside surface of the free end of the narrow finger portion **50**, directly opposite the end projection **62**, when the ring element is closed.

The above described arrangement permits the free end of the binder ring element to be inserted into entrance portion **68** and down into the open space **40** beneath the back plate **22** at a position offset from the center of the base portion of the ring element. The free end portion is then moved longitudinally of the back plate into the narrow locking portion **69** of the aperture **66**, with the projection **62** beneath the back plate and with the inclined surfaces **63**, **74** contacting each other. The inclined surfaces lock the free end against upward movement. The stop plate **68** prevents the free end of the binder ring element from moving backward if the extending finger portion above the top surface **32** is moved forward toward side wall **35**. As a result, the free end cannot be rocked or pivoted to work the heel of the free end up through the narrow aperture portion **69**.

A locking protrusion **80** extends from the surface **72** of the back plate **22** partially across the aperture **66** at the junction between entrance portion **68** and the narrow locking portion **69**. This locking protrusion diminishes the space through which the free end of the binder ring element must pass in its longitudinal movement between the entrance portion and locking portion of the aperture. This locking protrusion **80** inhibits longitudinal movement of the free end of the finger portion **50** between the locking portion **69** and the entrance portion **68** of the aperture **66**. The resiliency of the material allows the free end to be purposefully moved longitudinally when it is desired to open or close the binder ring element.

A portion of a modified back plate **22'** is shown in FIGURE 7, in which a modified aperture **66'** is provided. The aperture **66'** and back plate **22'** are identical to the aperture **66** and the back plate **22** previously described, with the exception of the shape of the entrance portion **68'**. The modified shape shown in FIGURE 7 provides sufficient opening for the curved periphery of the end projection **62**. The opening **68** in FIGURE 6 will accommodate an end projection having square corners. The aperture of FIGURE 7 functions in an identical manner to the aperture of FIGURE 6.

With the binder ring elements **24** in an open position, as shown in FIGURE 3, sheets to be secured in the binder are placed over the projections **62** of the free ends. The free end of each ring element is then moved forward and down toward the aperture **66**, pivoting the element about the hinge **58**. At the same time, the end is rotated or twisted to one side of a vertical plane passing through the central base portion of the ring element, as indicated by the line **2—2** in FIGURE 1, so that the free end overlies the entrance portion **68** of the aperture **66**. This position is indicated in phantom at the center ring element in FIGURE 1. The end projection **62** is then inserted into the entrance aperture **68** until the inclined upper surface **63** of the end projection **62** is below the lower inclined surface **74** of the back plate **22**. The free end of the binder ring element is then moved longitudinally past the locking protrusion **80** into the locking portion **69** of the aperture **66**. In this position the ring element is aligned in the vertical plane passing through the central portion of the base of the binder ring element. As explained above, the stress on the hinge **58** caused by twisting the narrow finger portion **50** to one side for interengagement with the back plate is minimized by the wide base portion **48** of the binder ring element. In addition, because of the above mentioned relationship between the length of the hinge **58** and width of the finger portion **50**, the binder ring element **24** pivots about the hinge **58**.

The binder ring elements **24** are opened by movement in an opposite manner than that just described. Thus, the free end is first moved longitudinally from the locking portion **69**, past the locking protrusion **80** and into the entrance portion **68** of the aperture **66**. The binder ring element is then pivoted upward about the hinge **58** to an open position. Because the element is pivoted about

its outer, lower, edge no portion of the element swings below the bottom surface of the back plate. Hence, there is no interference with the binder cover. The resiliency inherent in the hinge **58**, which is a thin or weakened portion of the integral binder ring unit, biases the ring element to a partially open position.

An improved construction for securing the back plate **22** to the back **28** of a binder cover **29** is best shown in FIGURES 5, 8 and 9 of the drawings.

For convenience and economy in manufacture and assembly, the binder ring unit **20** is secured to a folder by rivets **82** that pass through vertical bores **84** through the back plate **22** adjacent opposite ends thereof. The through-bores **84** are each formed in a depending circular boss **86** that extends downward from the undersurface of the back plate **22** a distance such that the lower end or surface **88** of the boss **86** forms in part the bottom surface **38** of the binder ring unit **20**. As best shown in FIGURE 5, the lower surface **88** is inclined in an upward direction, inwardly of the ends of the binder ring unit **20**. Thus, the bosses **86** at each opposite end are inclined in opposite directions, both upwardly toward the center. Each through-bore **84** has a counterbore **90** in the lower surface **88** of the boss **86**, and a counterbore **92** in the upper surface **32** of the back plate **22**.

The manner in which the rivets **82** and bosses **86** cooperate with the binder cover to secure the binder ring unit **20** in place, is best shown in FIGURES 8 and 9 of the drawings. During assembly, the rivet **82** is forced from outside the back **28** of the binder cover **29** through the cover and bore **84** of the back plate **22**. The rivet **82** has a flat outer head **94** larger than the diameter of the bottom counterbore **90**, and serves to clamp the back **28** of the cover **29** against the bottom surface **88** of the boss **86**. The counterbore **90** receives any burrs that are formed in the cover about the rivet **82** when the rivet is forced through the back **28** of the cover **29**. As a result, the inclined bottom surface **88** of the boss is in essentially flush contact with the inner surface of the back **28**. The inner end of the rivet **82** is upset or swaged, as at **96**, to clamp the binder ring unit **20** and cover back **28** tightly together.

Because both the back plate **22** and the cover back **28** are flexible, each deforms to a slight extent so that contact is obtained across the lower inclined surface **88** of the boss **86**. This contact along the inclined surface biases the back **28** and back plate **22** together inwardly of the rivet connection. As a result, the central portion of both the back plate **22** and the back **28** of the cover **29** are held in close contact, notwithstanding the fact that the connections are located only adjacent the far ends of the back plate **22**.

From the above it will be apparent that a ring binder of improved unitary construction has been provided that is durable, convenient to use and economical to manufacture.

While a preferred embodiment of the present invention has been described with particularity, it will be understood that various modifications and alterations may be made therein without departing from the spirit and scope of the invention, as set forth in the appended claims.

What is claimed is:

1. In a ring binder:

(a) a back plate to be fastened inside a binder cover and having a first side or bottom surface to be positioned against a back of the cover and a second side or top surface that faces away from the back of the cover;

(b) a plurality of binder ring elements integral with the back plate along a first longitudinal side edge of the back plate, each having a narrow finger portion and a wider base portion, said wider base portion being substantially shorter than the length of the back plate and said narrow finger portion having a free end portion interengageable with the back plate adjacent a second longitudinal side edge of the back plate; and

(c) flexible hinge portions

(i) integrally connecting the ring elements at spaced locations along the said first longitudinal side edge of the back plate,

(ii) substantially thinner than the thickness of the finger and base portions of the ring elements, and

(iii) located beneath the top surface of the back plate.

2. The ring binder of claim **1** wherein the flexible connection is of a length that is between two and three times as great as the width of the elongated finger portion of each binder ring element.

3. The ring binder of claim **1** wherein the wide base portion of the ring elements are essentially flush with the top surface of the back plate when the free ends of the binder ring elements are engaged with the back plate.

4. The ring binder of claim **1** including a plurality of recesses spaced along the first longitudinal side edge of the back plate, and wherein the wider base portion of each ring element is inset in one of said recesses when the free end portion is engaged with the back plate.

5. The ring binder of claim **4** wherein the wider base portion of each ring element is at least twice as wide as the width of the elongated finger portion and wherein the flexible hinge portion is of a thickness between 0.010 and 0.020 inch and of a length not greater than three times the width of the elongated finger portion.

6. The ring binder of claim **4** wherein the recesses are of a depth and width less than the depth and width of the back plate, forming an inset step portion in the outer surface of the back plate along the said first longitudinal side.

7. The ring binder of claim **6** wherein the hinge portions secure the ring elements to the step portion along a bottom and outer edge of each base of the ring elements.

References Cited by the Examiner

UNITED STATES PATENTS

210,991	12/1878	Byrne	129—24
1,593,416	7/1926	Adams	129—24
2,322,180	6/1943	Vernon	129—1 X
2,374,803	5/1945	Broadwell	129—24
2,413,616	12/1946	Freundlich	129—24
2,495,180	1/1950	Phillips	129—1
2,845,931	8/1958	Kinney	129—1
3,019,486	2/1962	Stinson	281—37.5 X
3,087,498	2/1963	Vogel	129—23
3,251,364	5/1966	Goldman	129—24

FOREIGN PATENTS

1,364,099	5/1964	France.
590,431	7/1947	Great Britain.

JEROME SCHNALL, *Primary Examiner.*