

April 12, 1932.

H. BENKE

1,853,192

COLLAPSIBLE FORM

Filed May 6, 1930

2 Sheets-Sheet 1

Fig. 1.

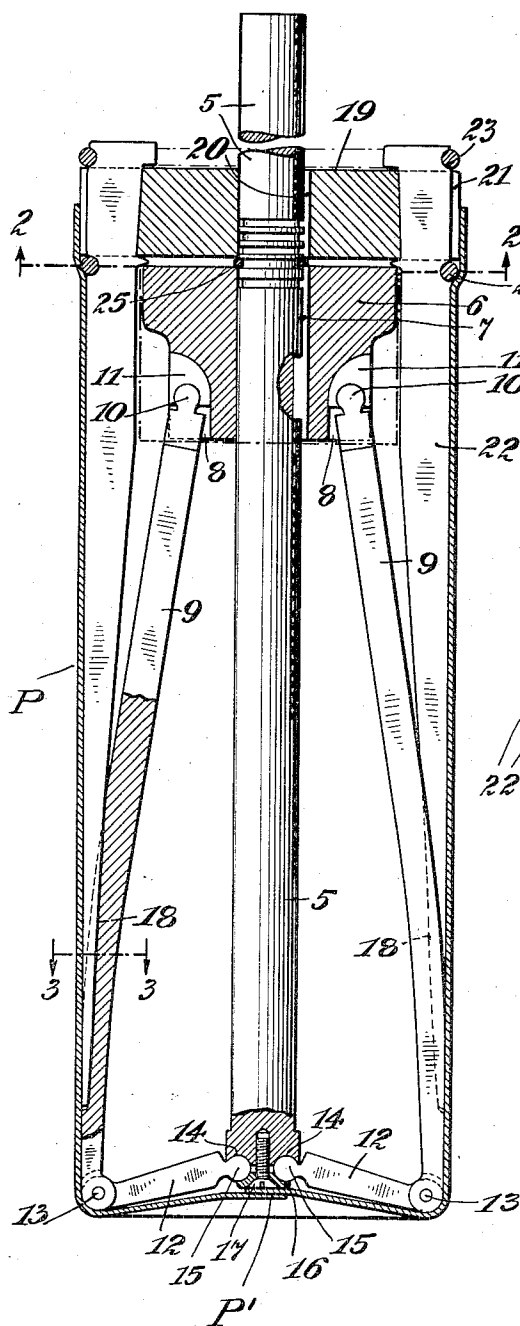


Fig. 6.

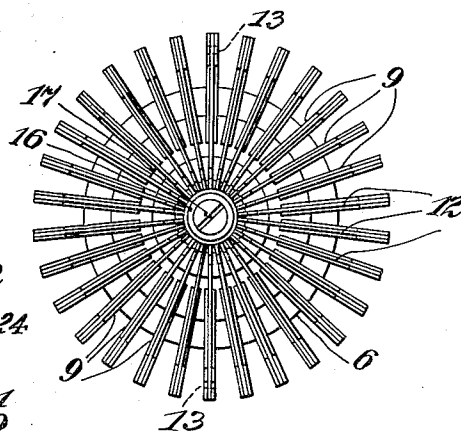


Fig. 2.

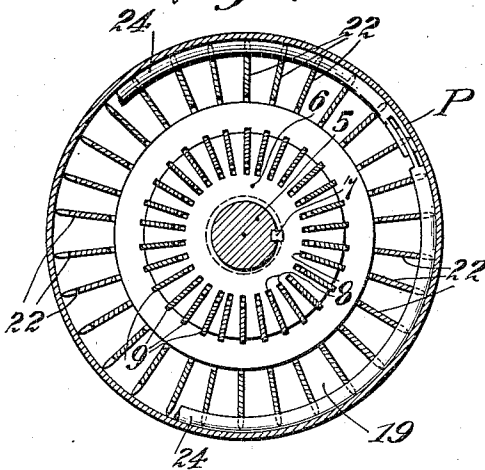
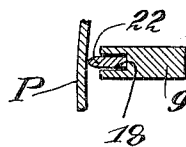


Fig. 3.



INVENTOR
Henry Benke
BY *C. P. Gephell*
his ATTORNEY

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2 Sheets-Sheet 2

Fig. 4.

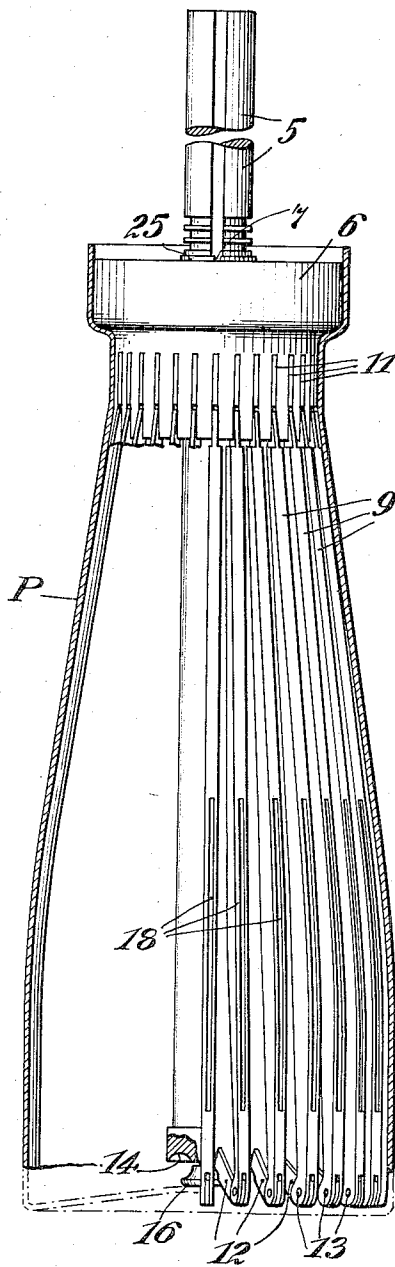
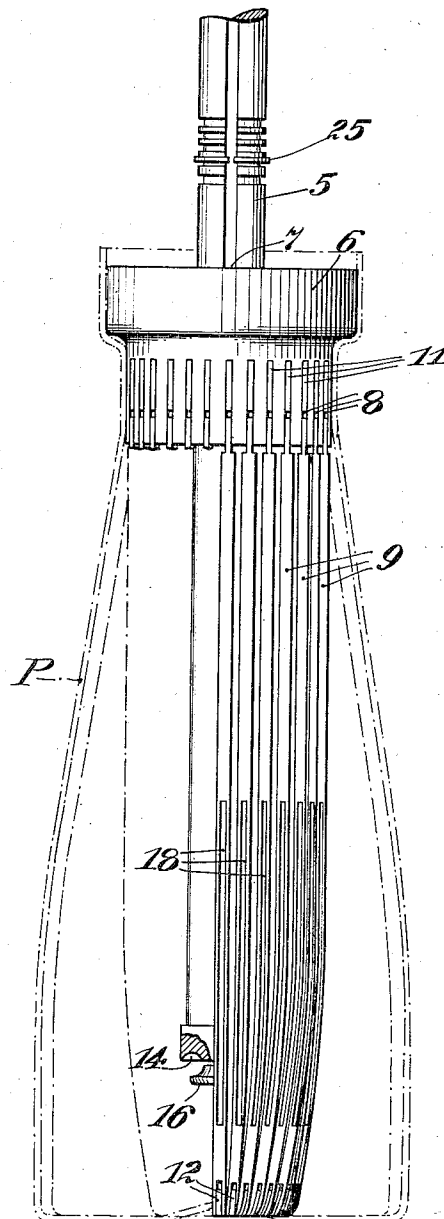


Fig. 5.



INVENTOR
Henry Benke
BY *C. P. Zepel*
his ATTORNEY

UNITED STATES PATENT OFFICE

HENRY BENKE, OF PLEASANTVILLE, NEW YORK

COLLAPSIBLE FORM

Application filed May 6, 1930. Serial No. 450,096.

This invention relates to collapsible forms, and has for its general object and purpose to provide a simply constructed and efficiently operating form of this type for use in the manufacture of paper receptacles.

It is a more particular object of the invention to provide a collapsible form consisting of separable collapsible and expansible units, said units being so constructed that when arranged in cooperative relation, the paper may be wound or wrapped thereon and supported in the form of a cylinder, the walls of which may then be fluted or corrugated by the application of suitable dies.

It is another object of the invention to provide a collapsible form particularly designed for the purpose of making paper receptacles in the general form of the conventional milk bottle which is of gradually decreasing diameter to the open end thereof. In one practical embodiment, the device includes a spindle and a head connected for relative axial sliding movement together with a plurality of longitudinally extending bars pivotally connected at one of their ends with said head and pivotally connected at their other ends by a plurality of radially extending links with one end of said spindle. Thus, by relative movement between the head and spindle in one direction, the longitudinal bars may be expanded by means of said link connections to define the longitudinal curvature of the walls of the receptacle. By then reversing the relative movement between the head and the spindle, the form may be contracted or collapsed so that it can be readily withdrawn through the open end of the receptacle.

With the above and other objects in view, the invention consists in the improved collapsible form and in the construction and relative arrangement of the several parts thereof, as will be hereinafter more fully described, illustrated in the accompanying drawings, and subsequently incorporated in the subjoined claims.

In the drawings, wherein I have disclosed one simple and practical embodiment of the invention, and in which similar reference characters designate corresponding parts throughout the several views,—

Figure 1 is a longitudinal sectional view showing the form expanded with the several sections in assembled cooperative relation and the paper wound thereon;

Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged detail horizontal section taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary side elevation showing one of the collapsible form sections expanded and the cylindrical corrugated wall of the receptacle shaped in conformity therewith;

Fig. 5 is a similar view showing the form collapsed in condition to be withdrawn through the open end of the receptacle, and

Fig. 6 is a bottom plan view of the expanded form.

The invention forming the subject matter of this application is designed more particularly for the purpose making receptacles in the form of the conventional milk bottle from a single sheet of paper and having the body wall of the receptacle provided with longitudinally extending corrugations. A receptacle of this type and a method of making the same is disclosed in my pending application Serial No. 363,804, filed May 17, 1929. However, it will be understood that the several novel mechanical features of my improved collapsible form might also be employed in the making of receptacles of other designs for various uses.

As herein shown, the device includes a rod or spindle 5 having a head 6 slidably engaged thereon, said head and spindle being held against relative rotation by means of a suitable key 7 secured to one of the parts and engaged in a key way on the other part. The head 6 is provided in one of its ends and in spaced relation to the bore thereof with a plurality of radially disposed spaced slots 8. A similar number of longitudinally curved metal bars 9 have reduced circularly formed portions 10 at one of their ends engaged in similarly shaped recesses for rocking or pivotal movement which are provided in the plates 11 frictionally fitted within the inner ends of the grooves or slots 8 or otherwise rigidly secured to the head 6.

The other ends of the bars 9 are bifurcated and pivotally connected as at 13 to the outer ends of the links 12. These links extend radially from one end of the rod or spindle 5, the end face of said spindle having radially disposed seats 14 upon which the circularly formed inner ends 15 of the respective links 12 have rocking engagement. The link ends are retained upon said seats by means of a bearing head or disc 16 opposed to the end of the spindle and secured in connection therewith by means of the screws 17.

Each of the bars 9 is provided in its outer edge with a longitudinally extending groove 18 which terminates at one of its ends adjacent to the pivot connection 13 between the bar and one of the links 12 and at its other end, merges into the outer edge surface of the bar. The purpose of these grooves will hereinafter be explained.

There is also engaged upon the rod or spindle 5 a second head 19 connected by means of the key 20 for axial movement along the spindle independently of the head 6. This head 19 is of greater diameter than the head 6 and in its outer portion is provided with a series of circumferentially spaced slots 21 corresponding in number with the number of the bars 9. In each of these slots, one end of a thin metal blade 22 is loosely engaged for rocking movement. The outer edges of these blades at opposite sides of the head 19 may be notched to receive the expansible and contractable metal rings 23 and 24 respectively. However, any other equivalent yieldable means may be employed for holding the blades 22 in a normal position relative to the head 19 in which the said blades extend from one side of the head in inwardly convergent relation. As clearly shown in Fig. 1 of the drawings, these blades gradually taper or decrease in width to their free ends and at their extremities are substantially equivalent in width to the depth of the grooves 18 in the bars 9 at the outer ends thereof.

Upon the spindle 5, a ring or collar 25 is suitably secured to limit relative movement of the heads 6 and 19 towards each other along the spindle 5. It will of course, be understood that the several blades 22 are always held in proper radial alignment with the respective bars 9 by the key 20 which is engaged in the same key way as the key 7 whereby any relative rotary displacement of the heads is prevented.

In the use of the device as above described, the spindle 5 and the head 19 are first axially moved relative to each other until the head 6 abuts against one side of the stop ring 25. The several bars 9 are thereby expanded by reason of the link connections 12 between said bars and the end of the spindle 5. The head 19 is now moved along the spindle 5 and as the

free ends of the metal blades 22 engage the curved outer sides of the respective bars 9, the said ends of the blades will be expanded outwardly. The tapering ends of the blades are received in the grooves 18, such longitudinal movement of the blades along the bars being continued until the head 19 also engages the stop ring 25. By reason of this outward expansion of the blades 22 at one side of the head 19, the inner edges of said blades at their other ends are brought into contact with the base walls of the grooves 21 in the head 19, said ends of the blades rocking upon the head and expanding the ring 24 while the ring 23 contracts. Thus, the wider ends of these blades are held in a more or less rigid connection with the head 19. Since the other ends of the blades 22 are engaged in the slots 18, the thin flexible blades are thereby held against any displacement at their free ends circumferentially of the form and retained in accurate radial alignment with the respective bars 9. When the parts of the form are thus assembled, it will be observed that the outer edges of the several blades 22 extend in parallel relation to the axis of the rod or spindle 5.

The paper sheet P is then wound upon the form and over the edges of the blades 22, one edge portion of the sheet being first properly creased so that as the winding of the sheet on the form progresses, the said creased edge of the sheet may be folded inwardly over the end of the form as indicated at P'. Thus, it will be seen that a straight walled cylindrical paper tube closed at one end may be readily produced. The cylindrical wall of this tube is now provided with longitudinally extending flutes or corrugations, by the application of pressure thereto by means of suitable die sections arranged to embrace said cylindrical wall, and whereby the paper is pressed inwardly between the outer edges of the spaced blades 22. After the flutes or corrugations have been formed and the die sections removed, the outer surfaces of the paper walls of the vessel may be coated with paraffin in any suitable manner.

The inner mold section consisting of the bars 9 is then collapsed by an outward axial movement of the spindle 5 and at the same time, the head 19 is moved away from the head 6 and the blades 22 withdrawn through the open end of the cylindrical receptacle.

The inner mold section is now again expanded and suitable shaping pressure means is applied against the outer side of the cylindrical wall of the partially formed receptacle to cause the same to closely conform to the curvature of the bars 9 and the head 6 as shown in Fig. 4 of the drawings. The spindle 5 is then drawn axially through the head 6 to collapse the form and position the ends of the bars 9 connected with the links 12 in closely grouped relation to each other,

as seen in Fig. 5 of the drawings. The diameter thereof is less than the diameter of the head 6 so that the collapsed form may be easily withdrawn through the contracted open end of the formed bottle or receptacle.

From the foregoing description considered in connection with the accompanying drawings, it will be seen that I have devised a very simply constructed and serviceable collapsible mandrel or form whereby such paper bottles or receptacles may be quickly and accurately produced and the longitudinally extending flutes or corrugations formed in the walls thereof. After the article has been given the desired shape as shown in Figs. 4 and 5 of the drawings, and the form of mandrel withdrawn therefrom, further operations may be performed upon the wall of the receptacle at its open end to provide a suitable internal groove for the reception of the edge of a bottle cap and to also form an annular reinforcing bead or rim on the edge of the bottle neck. Finally, the receptacle may be immersed in a paraffin solution to thoroughly coat both the inner and outer surfaces of its walls, increasing the stiffness or rigidity thereof, and rendering the receptacle thoroughly water tight.

In the foregoing description and the accompanying drawings, I have disclosed a preferred practical embodiment of the mechanical features of my present invention. Nevertheless, it will be understood that the device is susceptible of various mechanical modifications in the form, construction and relative arrangement of its several parts as may be required in the production of such receptacles of a particular predetermined shape or form. Accordingly, it is to be understood that I reserve the privilege of resorting to all such legitimate changes therein as may be fairly incorporated within the spirit and scope of the invention as claimed.

I claim:

1. In a device of the character described, a collapsible form including a spindle and head keyed thereon for sliding movement, expansible and contractable bars pivotally connected at one of their ends with said head, means connecting said bars at their other ends with one end of the spindle to expand said bars radially upon relative movement in one direction between said spindle and said head, and means independently movable axially along the spindle relative to said head having members yieldingly connected with the head and extending longitudinally of the spindle, said members and the bars having cooperating means to retain said members in radial alignment with the respective bars and with the outer edges of said members disposed in parallel relation to the axis of the spindle.

2. In a device of the character described, a collapsible form including a spindle and head

keyed thereon for sliding movement, expansible and contractable bars pivotally connected at one of their ends with said head, means connecting said bars at their other ends with one end of the spindle to expand said bars radially upon relative movement in one direction between said spindle and said head, and means independently movable axially along the spindle relative to said head having members yieldingly connected with the head and extending longitudinally of the spindle, each of said bars having a longitudinal groove in its outer edge, said grooves receiving the free ends of the respective members to retain said members and bars in radial alignment and with the outer edges of said members in parallel relation to the axis of the spindle.

3. In a device of the character described, an expansible and collapsible form including a circular series of bars, and means for radially moving said bars at one of their ends to expand and contract the form, and means adapted to be removably associated with said form consisting of a circular series of members movable axially with respect to said form, said members corresponding in number with said bars and coacting with the respective bars in the movement of said members in one direction to retain the same in radial alignment with the bars and with the outer edges of said members disposed in parallel relation to the axis of the form.

4. In a device of the character described, an expansible and collapsible form including a circular series of bars, and means for radially moving said bars at one of their ends to expand and contract the form, and means adapted to be removably associated with said form consisting of a circular series of members movable axially with respect to said form, each of said bars having a longitudinally extending groove in its outer edge, said members corresponding in number with the bars and having sliding engagement in said grooves of the respective bars to retain said members in assembled radial alignment with the bars and with the outer edges of said members in parallel relation to the axis of the form.

5. In a device of the character described, an expansible and collapsible form including a circular series of bars pivotally supported at one of their ends in fixed relation to each other, means operatively connected with the other ends of said bars to radially expand the same whereby said bars are relatively positioned to provide a longitudinally tapering form, and means removably associated with said form and including resiliently yieldable elements to coact with the respective expansible bars and provide in conjunction therewith a cylindrical form of uniform diameter throughout its length.

6. In a device of the character described, an expansible and collapsible form including

a circular series of bars pivotally supported at one of their ends in fixed relation to each other, means operatively connected with the other ends of said bars to radially expand the same whereby said bars are relatively positioned to provide a longitudinally tapering form, means removably associated with said form and including resiliently yieldable elements to coact with the respective expandible bars and provide in conjunction therewith a cylindrical form of uniform diameter throughout its length, and means for retaining said expandible bars and said elements in radially aligned relation and against relative displacement circumferentially of the form.

In testimony that I claim the foregoing as my invention, I have signed my name hereto.

HENRY BENKE.

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