Sept. 21, 1926. 1,600,750

F. K. BEZZENBERGER

MACHINE FOR MAKING BELLOWS

Filed June 25, 1924

Fig. 1.

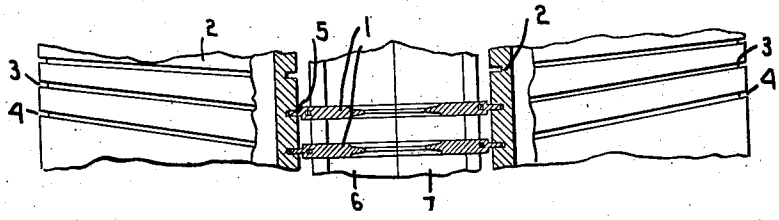


Fig. 2.

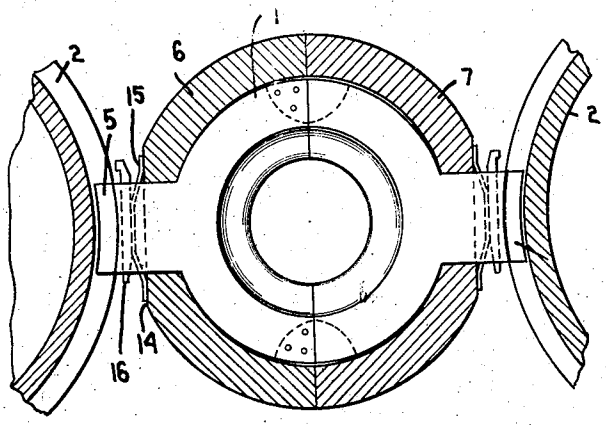


Fig. 3.

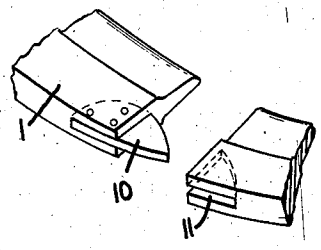


Fig. 4.

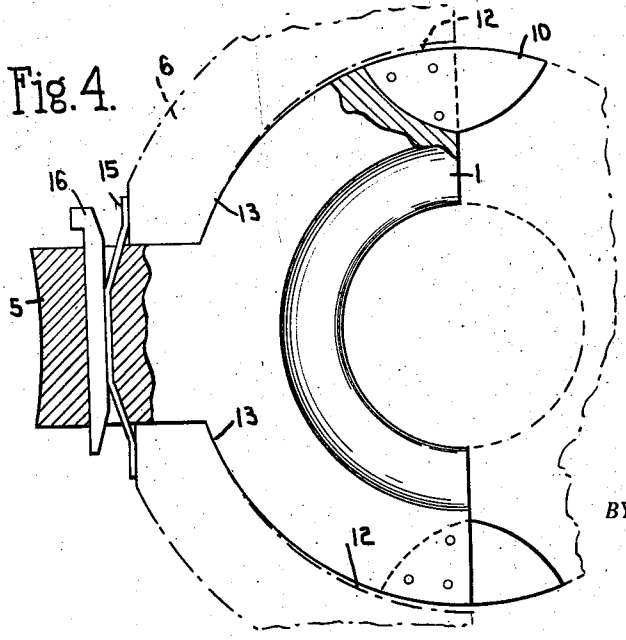
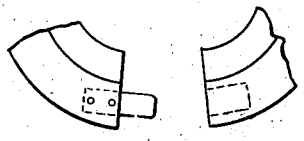


Fig. 5.



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ATTORNEYS.

Patented Sept. 21, 1926. 1,600,750

UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING BELLOWS.

Application filed June 25, 1924. Serial No. 722,356.

The present invention relates to a machine for making bellows, and is more particularly directed to certain improved apparatus for use in such a machine, such apparatus including rings or die elements against which the tube is formed, together with means for locking together the parts of such rings and guiding the same during their collapsing movement. The apparatus si particularly intended for use in a machine of the character described and claimed in my Patent No. 1,506.966, granted Sept. 2, 1924, and entitled "Method of an apparatus for making metallic walls." To the accomplishment of the foregoing and related ends said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawing:—

Fig. 1 is a vertical central section through the dies for use in such a machine, this view showing the means for spacing and collapsing the dies partially in elevation; Fig. 2 is a transverse longitudinal section of Fig. 1, this view being on an enlarged scale; Fig. 3 is a view in perspective showing the ends of the forming rings; Fig. 4 is a view similar to Fig. 2, but showing on an enlarged scale the resilient means for maintaining the rings at right angles to the support therefor; and Fig. 5 is a plan view illustrating modification of the construction shown in Fig. 3.

The machine described in my patent is one for making hollow corrugated walls in which a tube is disposed within a series of split annular forming rings and is then expanded outwardly into corrugations by internal hydraulic pressure, while at the same time the rings are brought toward each other to collapse the resulting corrugations and the tube is simultaneously collapsed lengthwise to produce a bellows.

In Fig. 1 I have shown a series of forming rings 1, together with means consisting of cam drums 2 for engaging the rings and controlling their spacing and movement. Each of the cam drums 2 is provided with a series of spiral slots 3, 4, etc., each of these slots being cut at a different angle and each receiving an extending finger or arm 5 on the outer side of and equidistant between the ends of each of the half rings 1. The rings 1 are formed in two halves as shown in Fig. 2 and are supported against radial pressure by semi-cylindrical guides or supports 6 and 7. These two supports are hinged to swing about an axis outside of the same (not shown), this movement of the supports opening the rings and allowing either the original tube to be inserted between the rings or the finished bellows to be removed therefrom. The cam drums and supports swing about the same axis with the rings.

In such a machine, where a very considerable internal pressure is applied, and where the rings are being collapsed axially of the tube during the application of this pressure, it has been found to be extremely difficult to so locate the two halves of the rings together and to so support and move these rings that the halves will move in perfect unison, and will not bind upon their supporting guides nor hinge at the point of engagement between the two halves of the rings. It is practically impossible to make a machine which will operate satisfactorily at a commercial speed if any of the above objections are present, and if there is the slightest hinging action or looseness between the two halves of the ring at the points where they engage each other the finished bellows will show an irregularity at these points and thickening of the metal which renders them useless for sensitive work.

I have found it possible by the present construction to maintain the two halves of the ring in a close engagement and to move these rings axially of the tube which is to be formed without any binding of the rings upon their supporting guides by using the following construction.

The two halves of each ring are formed with interlocking parts, either of the form shown in Fig. 3 or Fig. 5. In Fig. 3 I have shown the outer edge of the ring 1 slotted to permit the insertion of a tongue 10, which is then either riveted or welded securely into place. This tongue engages within a corresponding slot or recess 11 in the adjacent end of the other half ring, and is of sufficient size and of a closeness of fit which securely supports each of the half rings upon the other at this joint. This same joint is employed on both sides of the split rings.

The rings are supported against the cylindrical guide plates 6 and 7 and the inner surface of these guide plates is cut upon a circle (as at 12) having a slightly greater radius than the radius of the rings, which results in the ring 1 standing slightly away from the inner surface of the guides 6 and 7, except at the rear of these guides, and along the surface marked 13 in Fig. 4. This construction results in concentrating the friction between the rings and guides at the side of and substantially opposite to the extending arm 5 on the ring. Each extending arm 5 is received in a groove in the cam drum 2, and it is the rotation of this drum which raises or lowers each ring through engagement with the arm so that the force acting to move the ring along the support is concentrated at the same point that the frictional resistance is concentrated, and as a result there is no couple set up tending to tilt the rings or to rock them, and the rings are caused to move smoothly up and down in the guides.

The rear face 14 of the support 6 is faced off flat to form a seat for a spring 15 which is maintained in position in a slot cut through each arm 5 by means of a wedge or pin 16. The longitudinally extending surfaces of the slot formed in the arm are parallel to the flat surface 14 on the support 6 so that the action of this spring is to maintain the ring in a plane at right angles to the axis of the rings and supports.

In this construction each half ring is first positioned by the cam drum, the two complementary halves of each ring being brought into the same plane so that they may be accurately fitted together upon being swung about their axis with the tongue 10 fitting into the slot 11. When so joined each ring is practically solid, the tongues and slots supporting the registering ends against any tendency to move out of position. The rings are also held at right angles to the surface of the supports by the springs 15, so that registration is greatly insured.

Upon actuation of the cam drums the rings are moved as a unit, the friction of the half rings occurring practically in line with the application of the actuating force on the arms 5.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the means and the steps herein disclosed, provided those stated by any one of the following claims or their equivalents be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In apparatus of the character described, the combination of a series of parallel split forming rings having extensions therefrom at diametrically opposite points, actuating means engaging said extensions and adapted to move said rings axially, and means supporting said rings against radial pressure, said means engaging said rings adjacent said actuating means.

2. In apparatus of the character described, the combination of a series of parallel split axially movable forming rings having extensions therefrom at diametrically opposite points, actuating means engaging said extensions and adapted to move said rings axially, and supports for said rings, said supports including elements disposed adjacent said extensions and engaging said rings at the portion of their surface closely adjacent said extensions.

3. In apparatus of the character described, the combination of two semi-circular elements constituting a ring, means supporting said elements at points equidistant between their ends, and other means maintaining said elements in engagement in the same plane.

4. In apparatus of the character described, the combination of two semi-circular elements constituting a ring, means supporting said elements at points equidistant between their ends, interengaging means mounted on the edges of said two elements, said means guiding the same into engagement in the same plane, and other means normally maintaining said elements in substantially the same plane, said means being yieldable to permit said first named means to become effective.

5. In apparatus of the character described, the combination of two semi-circular elements constituting a ring, a semi-circular support for each of said elements, said support engaging the outer central portion of said element and having an opening therethrough, an extension on each element extending through such opening, and movable means engaging said extension for actuating said element.

6. In apparatus of the character described, the combination of two semi-circular elements constituting a ring, a semi-circular support for each of said elements, said support engaging the outer central portion of said element and having an opening therethrough, an extension on each element extending through such opening, resilient means normally maintaining said element at right angles to said support, and means engaging said extension for moving said element in a direction parallel to said support.

7. In apparatus of the character described, the combination of two semi-circular elements constituting a ring, a semi-circular support for each of said elements, said support engaging the outer central portion of said element and having an opening therethrough, an extension on each element ex-

tending through such opening, interengaging means on the meeting edges of said elements, and means normally maintaining said elements in the same plane.

8. In apparatus of the character described, the combination of a plurality of parallel split forming rings, means separately supporting the sections of each ring, and means on the meeting ends of the sections whereby the sections are interlocked in a plane against relative movement.

9. In apparatus of the character described, the combination of a plurality of parallel split forming rings, means separately supporting the sections of each ring, means cooperating with the ring sections and the supports for normally maintaining said ring sections at right angles to their axis, and means on the meeting ends of the sections whereby the sections are interlocked in a plane against relative movement.

10. In apparatus of the character described, the combination of a plurality of parallel split forming rings, means separately supporting the sections of each ring, means cooperating with the ring sections and the supports for normally maintaining said ring sections at right angles to their axis, and means on the meeting ends of the sections whereby the sections are interlocked in a plane against relative movement, said first-named means being yieldable to permit the interlocking of said last-named means.

11. In apparatus of the character described, the combination of a plurality of parallel split forming rings, extensions on the sections of the rings, actuating means engaging said extensions and adapted to move said rings axially, and means supporting said ring sections only adjacent said extensions.

12. In apparatus of the character described, the combination of a plurality of parallel split forming rings, extensions projecting midway between the ends of the ring sections, actuating means engaging said extensions and adapted to move said rings axially, and means supporting said ring sections and engaging the same only adjacent said extensions.

13. In apparatus of the character described, the combination of a plurality of parallel split forming rings, extensions projecting midway of the length of each of the ring sections, actuating means engaging said extensions and adapted to move said rings axially, and semi-circular supports embracing said rings and provided with apertures through which said extensions project into engagement with said actuating means, said supports having a larger radius of curvature than said ring sections and engaging said ring sections only adjacent said extensions.

14. In apparatus of the character described, the combination of a pluraiity of parallel split forming rings, means on the adjacent ends of the ring sections for locking the sections of each ring against relative movement, extensions projecting midway of the length of each of the ring sections, actuating means engaging said extensions and adapted to move said rings axially and supports for said ring sections engaging the same only adjacent said extensions.

15. In apparatus of the character described, the combination of a plurality of parallel split forming rings, means on the adjacent ends of the ring sections for locking the sections of each ring against relative movement, extensions projecting midway of the length of each of the ring sections, actuating means engaging said extensions and adapted to move said rings axially, supports for said ring sections engaging the same only adjacent said extensions, and yielding means between said ring sections and supports normally maintaining the ring sections at right angles to their axis but yieldable to permit the interlocking of said sections.

Signed by me, this 28th day of June, 1924.

FRED K. BEZZENBERGER.