Aug. 8, 1950 G. INGRAM 2,518,326

INFLATABLE FORM FOR DIPPED RUBBER ARTICLES

Filed June 3, 1947 2 Sheets-Sheet 1

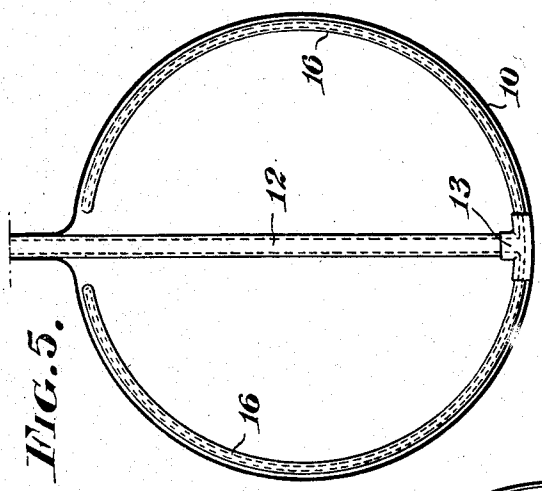


FIG. 5.

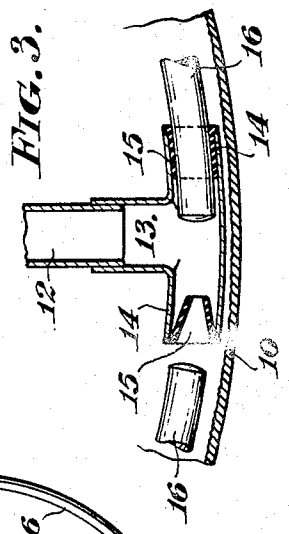


FIG. 3.

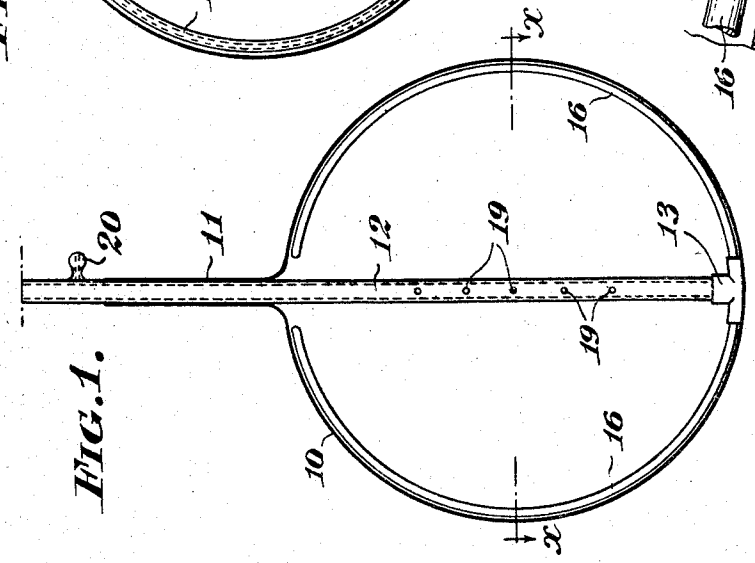


FIG. 1.

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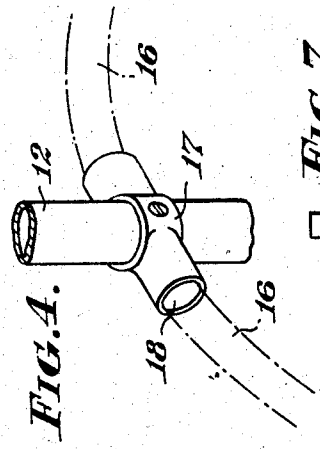


FIG. 4.

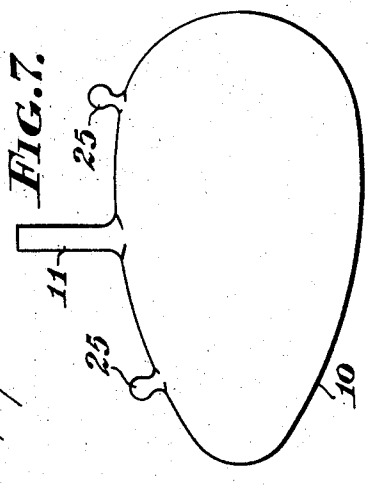


FIG. 7.

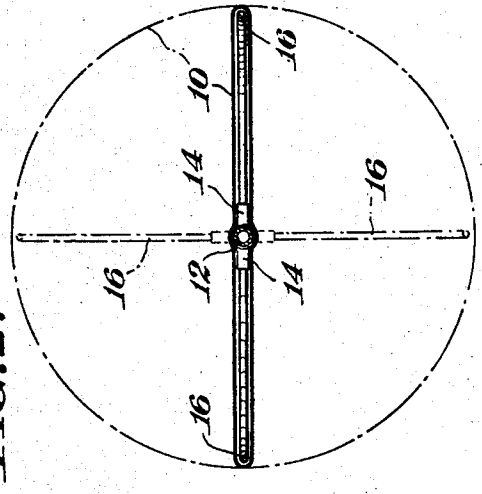


FIG. 2.

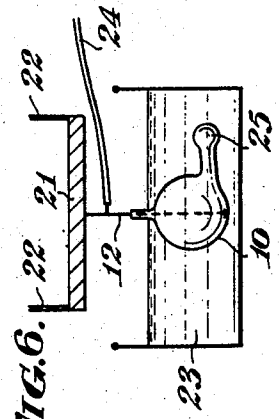


FIG. 6.

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INFLATABLE FORM FOR DIPPED RUBBER ARTICLES

George Ingram, London, England

Application June 3, 1947, Serial No. 752,108
In Great Britain June 26, 1942

Section 1, Public Law 690, August 8, 1946
Patent expires June 26, 1962

3 Claims. (Cl. 18—41)

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This invention relates to the manufacture of rubber articles made by dipping a former into liquid latex, rubber solvent or rubber compound vulcanised or unvulcanised and then withdrawing same therefrom, the former being removed from the interior of the rubber article which forms upon it after the coating which constitutes such article has dried off sufficiently. Such removal of the article from the former is commonly effected by stripping the article off the former.

If it is required for the manufactured article to have a neck which is small relative to the body portion of the article, for instance as in a balloon, stretching of the neck has to take place in order to allow the former to be removed from the article or vice versa, with the result that production is not as easy or as rapid as might be desired. Also, owing to the limited extent to which the neck can stretch without risk of damage, it is impossible by present methods to manufacture an article having a body portion of more than a predetermined dimension with respect to the neck. The present invention has in view to overcome this last difficulty so as to permit an article to be manufactured having a body portion of larger dimensions relative to the neck size. The invention further aims at expediting the manufacture of articles wherein the body and neck dimensions accord with present practice.

The invention consists in the provision of a former for use in the manufacture of dipped rubber articles, and which comprises an envelope made of substantially impervious flexible sheet material and having a neck, resilient bracing means, contained within said envelope, and a rigid manipulating stem passing through the neck of the envelope and into the interior thereof, the bracing means being adapted to maintain the envelope in a taut, distended or expanded condition, and being adapted by its resiliency to allow the envelope to collapse to the extent necessary for withdrawal of said envelope through the neck of the formed article.

The said bracing means can take varying forms and in one embodiment of the invention consists of resilient arms radiating from the manipulating stem and forming components of a framework, said arms being urged by their inherent springiness to maintain the envelope in a taut, distended or expanded condition. In another embodiment the said bracing means consists of tubular flexible arms radiating from the stem and arranged to form continuations of the bore extending through the stem, said arms having closed outer ends and

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being adapted to be inflated by way of the stem and to be thereby stiffened to serve as the bracing means. In another form of the invention the bracing means consist of ribs formed integrally with the envelope on the interior thereof. In a further embodiment of the invention the former comprises an inflatable envelope having a neck, a rigid tubular manipulating stem passing through said neck and extending across the envelope to a point opposite said neck, and one or more openings formed in said stem to enable the envelope to be inflated and deflated by way of the stem.

In the accompanying drawings,

Figure 1 is a vertical section of a dipping former constructed according to one embodiment of the invention,

Figure 2 is a cross-section on line x—x in Figure 1,

Figure 3 is a sectional detail view showing the manner in which bracing arms are attached to the stem of the former,

Figure 4 is a perspective view showing a means for engaging the outer ends of said bracing arms to constrain same to take up required forms,

Figure 5 is a sectional view of a former embodying inflatable bracing arms,

Figure 6 is a diagrammatic view showing the manner of arranging and using an inflatable former in accordance with the invention, and

Figure 7 is an elevation showing a form of article which can be conveniently made by the use of an inflatable former provided in accordance with the invention.

Referring firstly to Figures 1, 2 and 3, there is provided an envelope 10 made of flexible sheet material such as oilskin, rubber, waxed paper or textile fabric which has been coated or impregnated so as to be substantially impervious, or any sheet material having similar characteristics, said envelope having a tubular neck 11. Preferably said envelope has a serrated inner surface. A rigid tubular manipulating stem 12 which passes through the said neck 11 has screwed upon its inner end a tubular T-piece 13. Each of the arms 14 of said T-piece is provided internally with a tapering resilient throat piece 15 which may be made of rubber. Strips or rods 16 made of whalebone, springy metal or other resilient material are adapted to be inserted into the respective throat pieces 15, so that each of said strips or rods is thus held by one end to the stem 12, the said throat piece effecting a firm grip on the said strip or rod and preventing accidental detachment thereof. The said strips or rods 16 constitute arms of a framework for bracing the

envelope so as to maintain same in a taut, distended or expanded condition, said arms radiating from the stem and extending back towards the neck of the envelope. In the construction shown, the framework formed by said arms has the form of an interrupted hoop but may have any desired form and configuration. The serrated internal surface of the envelope assists in retaining the arms 16 in the throat pieces 15.

In Figure 1 the arms 16 have their upper ends free, but if desired means may be provided on the stem 12 for engaging the said upper ends of said arms to constrain them to take up a particular contour. Figure 4 illustrates a device for this purpose consisting of a collar 17 adjustably mounted on the stem 12 and having notches 18 into which the upper ends of the arms 16 can be engaged.

In the portion of the tubular stem 12 which is situated within the envelope 10 there are formed a plurality of holes 19. Said holes 19 permit the passage of air into and out of the envelope when same is collapsing and when taking up a taut or expanded condition, or said holes may be utilised for inflation of the envelope by air passed under pressure through a valve-fitted nozzle 20 and down the stem 12.

In the example shown (see especially Figure 2) the bracing arms 16 and the stem 12 are disposed all in the same plane so that the envelope 10 normally has a substantially flat condition but is adapted to be expanded under air pressure so as to take up a spherical or other required form as shown by dotted lines.

In the modification shown in Figure 5, the bracing arms 16 consist of tubes made of flexible material such as rubber and having closed outer ends, said tubes being suitably secured to a T-piece 13 provided on the lower end of the stem 12 and being so arranged that they form branch continuations of the bore therein. In this case the stem 12 will not be provided with holes for air escape from or for inflation of the envelope 10 as the stem bore will be utilised for setting up air pressure in the tubular arms 16. By such air pressure the said arms 16 will be stiffened to serve as a bracing means, whereas said arms 16 will be relatively limp when deflated. As a modification of this arrangement the stem 12 may be provided with an inner tube for inflation of the tubular arms 16, the stem proper being formed with holes for air escape from or inflation of the envelope as explained with reference to Figure 1.

As an alternative to the construction shown in Figures 1 and 3, the bracing framework may consist of a single length of strip or rod passed through the head of a T-piece such as 13 and centrally anchored therein so that the respective end portions of said strip or rod constitute the arms 16.

In each of the constructions above described the neck 11 of the envelope can be made in one piece or may be formed from two identical parts seamed together.

In the construction shown in Figures 1 to 3, the bracing arms 16 exert themselves to maintain the former envelope 10 distended in the plane of said arms and in a flat, natural condition. Said arms 16 however can be pressed towards the stem 12 and be thus distorted to approximate straight forms in which they take up positions nested against the stem when it is desired to collapse the former. In assembling the former for use, and assuming that the arms

16 and T-piece 13 are alone already contained in the envelope 10, the tubular stem 12 is passed through the envelope neck 11, said neck being stretched sufficiently to permit of this. The inner end of the stem will reach a position close to the perimeter of the envelope, at a position directly opposite the envelope neck 11. Said neck will contract on to the stem 12 to grip same tightly. The arms 16 are now fitted into the throat pieces 15 of the T-piece 13. These operations are performed by gripping the parts through the envelope. The former is now ready to be dipped into the solution.

Air escape permitted from the interior of the former by way of the holes 19 in the tubular stem 12, the bore in said stem and the valve-fitted nozzle 20, allows for the release of any pressure which may be set up by deformation of the envelope on submersion into the dipping solution.

In the construction shown in Figure 5 the tubular arms 16 have a limp condition when deflated to permit of the former being easily and readily withdrawn through the neck of the formed article.

Although in the constructions above described the bracing framework comprises only a single hoop, it is to be understood that any desired number of hoops may be provided, arranged or adapted to be arranged in different planes. A framework composed of such hoops will give the former a bulbous, spherical or other three-dimensional as compared with a two-dimensional form.

The manipulating stem 12 serves as a means for suspending the former from any desired dipping device; for instance, as shown in Figure 6, the said stem (and the stems of any additional formers to be immersed simultaneously) may be attached to a board 21 adapted to be raised and lowered by suspension cords 22 to immerse the former into a dipping bath 23.

In a modification (not shown) the envelope is not provided with bracing means but is adapted to be inflated in order to bring it to the required shape and form. In this case the tubular manipulating stem 12 passes through the envelope neck as a tight fit and extends across to a point opposite said neck where it is provided with a suitable foot piece, and one or more openings are formed in the said stem to enable the envelope to be inflated and deflated by way of the bore through the stem. Thus inflation, apart from being used in a former having bracing means, can be utilised as a sole means for distending the envelope, especially in the manufacture of small articles.

If the former envelope 10 has air-retaining properties, then the method of use may include inflating said envelope either before, during or after immersion into the dipping solution, a supply duct 24 for compressed air being connected up to the nozzle 20 provided on the tubular stem (Figure 6). Such inflation serves in co-operation with the internal bracing means to distend the envelope, and if the envelope has elastic properties it may even expand same. Such inflation is particularly advantageous in the case where the manufactured article is required to have one or more protrusions, such as 25 shown in Figure 7, the former envelope then being immersed into the dipping solution in a deflated condition and being inflated whilst immersed, thereby making the protrusion (as well as the main body of the envelope) rigid, the inflated condition being

maintained after removal from the dipping solution. This overcomes the objection that if the protrusion was rigid before immersion, same would resist submersion and might distort, with the possibility of introducing air bubbles into the solution.

It will be readily understood that collapse of the former which can be effected whatever its construction in accordance with the invention, enables the manufactured article to be easily removed from the former, even when the body of the former has a dimension relative to a neck, considerably greater than the maximum dimension possible by existing methods of manufacture. If the manufactured article is required to have lateral protrusions then the collapse of the former will be of great advantage since a former having a rigid protrusion of substantial length could not be employed by present-day methods owing to the neck being unable to expand sufficiently for the protrusion to pass through. The invention is also especially advantageous in the manufacture of a balloon or other article having an eccentric shape or having a neck disposed laterally with respect to the major axis of the article as in the example illustrated in Figure 7.

I claim:

1. A former for use in the manufacture of dipped rubber articles having a neck, comprising an envelope made of substantially impervious flexible sheet material and also having a neck, a tubular rigid stem passing through the neck of the envelope, tubular flexible arms communicating with and radiating from the lower end of said stem in different directions and arranged to form branch continuations of the stem bore, said arms being closed at their outer ends and adapted to be inflated by way of the tubular stem and to be thereby stiffened to serve as a bracing means for the envelope to maintain same in a taut distended or expanded condition and being adapted on deflation to allow the envelope to collapse readily to permit of said envelope being withdrawn through the neck of the formed article.

2. A former for use in the manufacture of dipped articles of rubber or rubber-like material, said former comprising an envelope of substantially impervious flexible sheet material having a neck, a tubular stem extending through the neck of said envelope into said envelope, and tubular flexible inflatable and deflatable arms connected to and in communication with said stem at their inner ends and having their outer ends closed and free, whereby they are adapted to be inflated and stiffened to brace said envelope and to maintain the same taut by fluid supplied to them through said stem and whereby when deflated they are adapted to permit ready collapse of said envelope for easy removal of the latter through the neck of an article formed about the same.

3. A former for use in the manufacture of dipped articles of rubber or rubber-like material, said former comprising an envelope of substantially impervous flexible material having a neck, a tubular stem extending into said envelope through said neck, and tubular flexible inflatable and deflatable arms disposed in said envelope and connected to and in communication with said stem for inflation and deflation by fluid supplied to and exhausted from them through said stem, said arms when inflated being substantially stiff and serving to maintain said envelope taut and when deflated permitted ready collapse of said envelope for easy removal of the latter through the neck of an article formed about the same.

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