Sept. 7, 1965 T. T. HADELER 3,204,862

ANNULAR VENTURI

Filed May 8, 1963

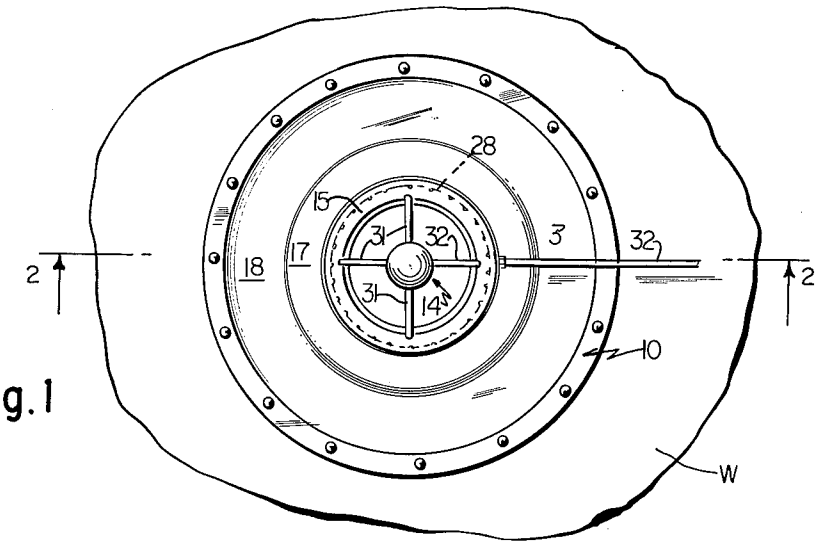

Fig. 1

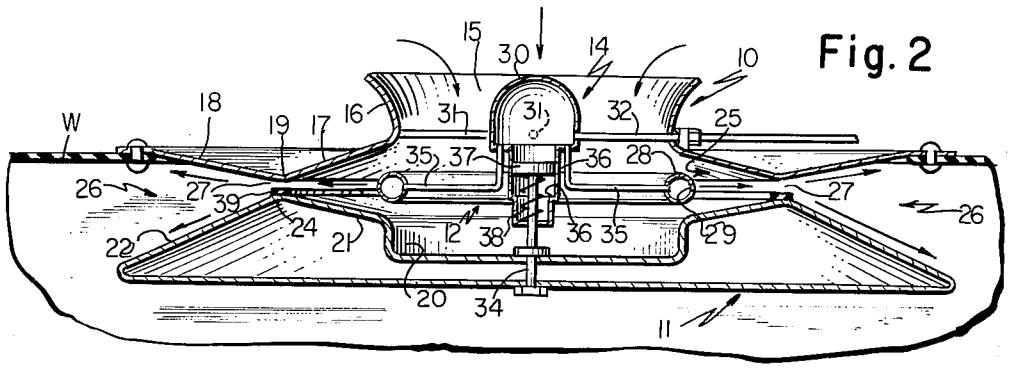

Fig. 2

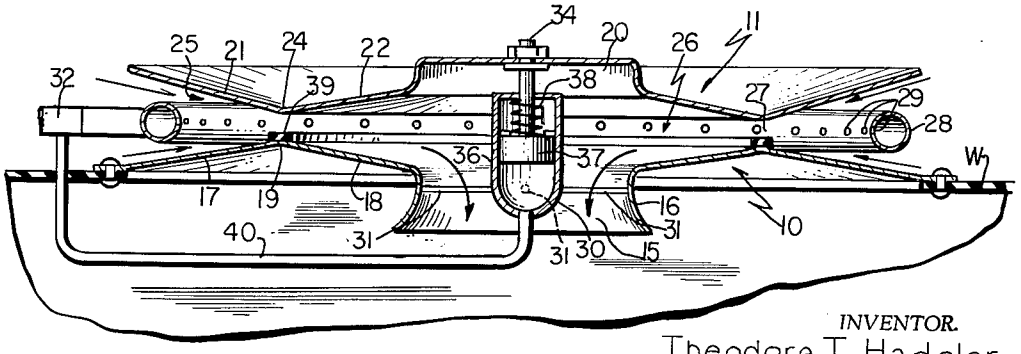

Fig. 3

INVENTOR.
Theodore T. Hadeler
BY
ATTORNEY

United States Patent Office

3,204,862

Patented Sept. 7, 1965

3,204,862

ANNULAR VENTURI

Theodore T. Hadeler, Montvale, N.J., assignor to Specialties Development Corporation, Belleville, N.J., a corporation of New Jersey

Filed May 8, 1963, Ser. No. 278,948
13 Claims. (Cl. 230—95)

The present invention relates to gas pumps, and, more particularly, to aspirating apparatus adapted to inflate various inflatable structures such as rafts, boats, escape chutes, cushions and the like by means of a relatively large volume of gas at a relatively low pressure.

Heretofore, jet pumps operated by a gaseous fluid under pressure have been utilized for entraining ambient air and directing the mixture into the structure to be inflated. Such pumps included a venturi which was lengthy and/or bulky and which was required to be mounted within the inflatable structure, whereby considerable difficulty was experienced in folding the structure, when deflated into a compact package. Also, such venturis are generally inefficient.

According, an object of the present invention is to provide improved jet jump apparatus which is extremely small and compact but yet has high performance capabilities.

Another object is to provide such apparatus which has a closure associated therewith.

A further object is to provide such apparatus which is simple and economical in construction and is reliable in operation.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

In accordance with the present invention, the foregoing objects generally are accomplished by providing apparatus comprising a ring having a central opening, a plate facing the ring, the ring and the plate having concentric radially flared annular zones constructed and arranged to provide an annular venturi having a flared inlet section, a flared outlet section and a throat between these sections, nozzle means for directing an annular zone of gaseous medium under pressure into the inlet section, and means for mounting the nozzle means between the ring and the plate and attaching the plate to the ring.

In the drawing:

FIG. 1 is a plan view of an annular venturi illustrating one embodiment of the present invention.

FIG. 2 is an enlarged sectional view taken along the line 2—2 on FIG. 1.

FIG. 3 is a view similar to FIG. 2 illustrating another embodiment of the present invention.

Referring now to FIGS. 1 and 2, there is shown apparatus which generally comprises a ring **10**, a plate **11** facing the ring, the ring and the plate being constructed and arranged to provide an annular venturi as will be described in detail hereinafter, nozzle means **12** for directing gaseous medium under pressure into the venturi, and strucure **14** for mounting the nozzle means and attaching the ring to the plate.

The ring **10** has a central opening **15** surrounded by an upwardly extending flared sleeve **16** through which ambient air is entrained; and has a flange section formed with an inner annular outwardly and downwardly slanting portion **17** and with an outer annular inwardly and downwardly slanting portion **18** which meets the portion **17** at an angle of about 145° to provide an annular depending zone **19**. The peripheral zone of the ring portion **18** is suitably secured within an opening formed in the wall W of an inflatable device.

The plate **11** has a central well **20** facing the opening **15** of the ring and being of about equal diameter as this opening; and has a flange section below and facing the flange section of the ring which is formed with an inner annular inwardly and downwardly slanting portion **21** and with an outer annular outwardly and downwardly slanting portion **22** which meets the portion **21** at an angle of about 145° to provide an annular projecting zone **24**.

The venturi as shown in FIG. 2, has a flared inlet section **25** provided by the slanted portions **17** and **21**, a flared outlet section **26** provided by the slanted portions **18** and **22**, and a throat **27** between the inlet and outlet sections provided by the annular zones **19** and **24**. The inlet section **25** is located between the sleeve **16** and the wall **20**.

The nozzle means **12** is a hollow ring **28** at the entrance of the inlet section **25** having a plurality of circumferentially spaced, radially outwardly facing apertures **29** for directing an annular zone composed of jets of gaseous medium under pressure into the venturi inlet section **25**.

The mounting structure **14** includes a hollow body **30** connected to sleeve **16** of the ring **10** by radial rods **31** and a tube **32** extending into the body and in fluid flow communication with a source of gaseous medium under pressure (not shown), a stem **34** for connecting the plate **11** to the body **30**, and a plurality of radial tubes **35** for supporting the nozzle means ring **28** having their inner end in flow communication with the interior of the body **30** and having their outer end in flow communication with the bore of the ring **28**, whereby the tube **32** can supply the pressure medium to the ring and the plate **11** is supported within the inflatable device below the ring **10**.

The apparatus so far described can be constructed and arranged to enable the plate **11** to serve as a closure for the opening **15**. This is accomplished by providing the body **30** with an upright stepped cylinder **36** at its lower end having a slidable piston **37** therein which is connected to the stem **34**, whereby the plate **11** moves with the piston.

A spring **38** under compression and disposed between the underside of the piston **37** and the lower end wall of the cylinder **36** normally urges the piston upwardly so that the piston moves the plate upwardly and the annular zones **19** and **24** at the venturi throat are brought into engagement. When the pressure medium is introduced into cylinder at is upper end to overcome the spring **38**, the piston and the plate move downwardly to the position shown in FIG. 2 whereby the annular venturi is established and the inflatable device is inflated. The cylinder **36** has a step **33** which serves as a stop for the piston to properly position the ring **10** and the plate **11** with respect to each other so that an annular venturi of predetermined performance capabilities is established. As the pressure of the medium decays, the spring **38** again is effective to move the plate **11** upwardly to close off the opening **15** and retain the inflation medium within the inflatable device by the seal at the zones **19** and **24**.

The ring **10** and the plate **11** may be constructed of a plastic resin which by its nature would provide a good sealing surface when the annular zones **19** and **24** engage. However, either one or both of these zones may have a sealing ring **39** thereon whereby the ring and the plate could be constructed of metal.

In FIG. 3, apparatus is shown which essentially is the same as that described in connection with FIGS. 1 and 2, and like reference numerals are applied to like or functionally equivalent parts. The significant differences are that the ring **10** and the plate **11** are inverted with the plate positioned above the ring at the exterior of the in-

flatable device, the venturi is reversed in the sense that flow through its throat **27** is radially inwardly rather than outwardly, and the nozzle means ring **28** surrounds the venturi inlet section **25**, rather than being within it, and has radially inwardly facing apertures **29**.

In this modified arrangement, the ring **28** is structurally connected for support to the ring **10**, and a tube **32** supplies the pressure medium directly to the ring **28**. The body **30** is supported on the ring **10** by rods **31** at its lower end and the piston cylinder **36** is connected to the supply tube **32** by a conduit **40**.

The compression spring **38** is disposed between the upper face of the piston **37** and upper end wall of the cylinder **36** so that the spring normally urges the piston and the plate downwardly to seal the opening **15**. When the pressure medium is applied, it acts on the underside of the piston whereby the piston is moved upwardly to position the plate **11** as shown and to thereby establish the annular venturi.

From the foregoing description it will be seen, that the present invention provides a simple, compact and efficient annular venturi.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.

I claim:

1. Apparatus comprising a ring having a central fluid flow conducting opening, a plate having a central imperforate section facing said opening in said ring, said ring and said plate having concentric radially flared annular zones constructed and arranged to provide an annular venturi having a flared inlet section, a flared outlet section and a throat between said sections, nozzle means for radially directing an annular zone of gaseous medium under pressure into said inlet section, and means for mounting said nozzle means between said ring and said plate and mounting said plate on said ring.

2. Apparatus according to claim **1**, wherein said plate is below said ring and said venturi outlet section surrounds said venturi inlet section.

3. Apparatus according to claim **2**, wherein said ring has an upwardly extending sleeve connected at the opening thereof for entraining ambient air.

4. Apparatus according to claim **1**, wherein said plate is above said ring and said venturi inlet section surrounds said venturi outlet section.

5. Apparatus according to claim **1**, wherein said central section of said plate has a well therein facing the opening of said ring.

6. Apparatus according to claim **5**, wherein said ring has an upwardly extending sleeve connected at the opening thereof for entraining ambient air and said inlet section is located between said sleeve and said well.

7. Apparatus according to claim **1**, wherein said mounting means include elements for moving said plate with respect to said ring to establish the annular venturi and to cause said plate and said ring to engage at said venturi throat to render said ring opening ineffective.

8. Apparatus according to claim **1**, wherein said nozzle means is a tubular ring having circumferentially spaced apertures facing said inlet section.

9. Apparatus according to claim **1**, wherein said mounting means includes structural elements secured to said ring and said plate and having said nozzle means secured thereto.

10. Apparatus according to claim **9**, wherein said structural elements include a cylinder secured to said ring and having an inlet for fluid medium under pressure, a piston in said cylinder having a stem secured to said plate to mount said plate for movement away from said ring when fluid medium under pressure enters said cylinder, and a spring opposing movement of said piston to effect movement of said plate towards said ring and in engagement therewith at said throat when there is no fluid medium under pressure in said cylinder.

11. Apparatus according to claim **10**, including annular sealing means at said throat.

12. Apparatus according to claim **11**, including means for securing said ring within an opening formed in an inflatable device, whereby said plate serves as a closure for the opening of the device.

13. Apparatus according to claim **10**, wherein said nozzle means is secured to said mounting means structural elements, said cylinder has an outlet and said nozzle means has an inlet connected in fluid flow communication with said cylinder outlet, and said cylinder inlet is connected to a source of gaseous medium under pressure, whereby upon release of the medium from its source the piston is actuated to position said plate and establish the annular venturi and said nozzle means directs the medium into said inlet section.

References Cited by the Examiner

UNITED STATES PATENTS

1,282,595	10/18	Kothny et al.	230—112
1,296,567	3/19	Suczek	230—95 X
1,563,752	12/25	Kothny	230—95

LAURENCE V. EFNER, *Primary Examiner.*

WARREN E. COLEMAN, *Examiner.*