Oct. 31, 1967 L. H. MOTT 3,349,462

AIR ROLLER

Filed June 14, 1966

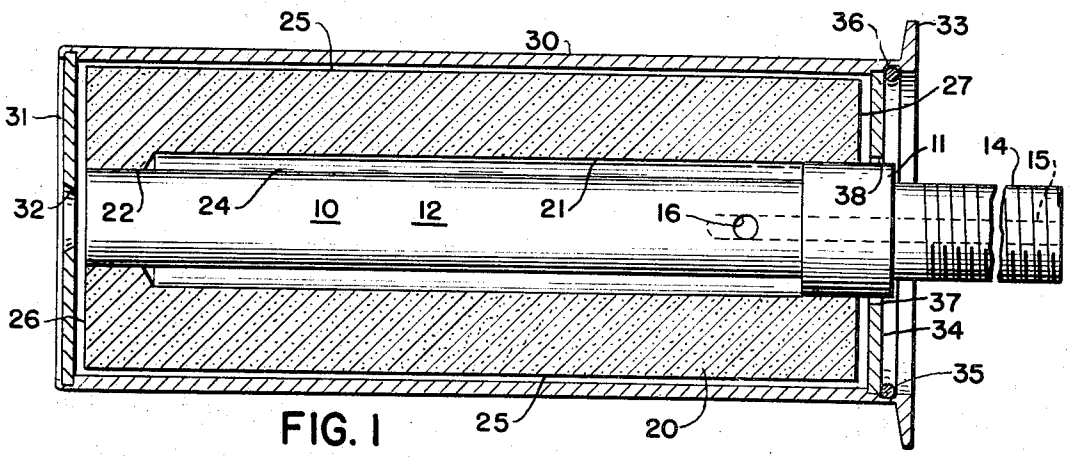


FIG. 1

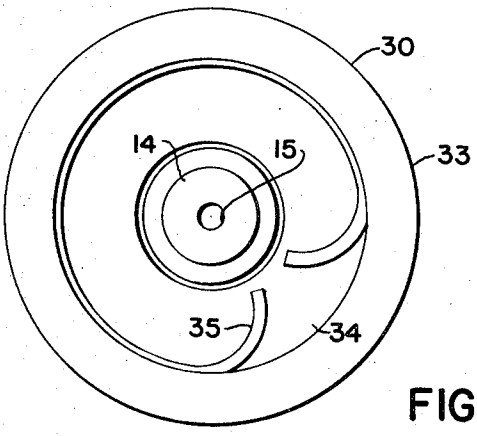


FIG. 2

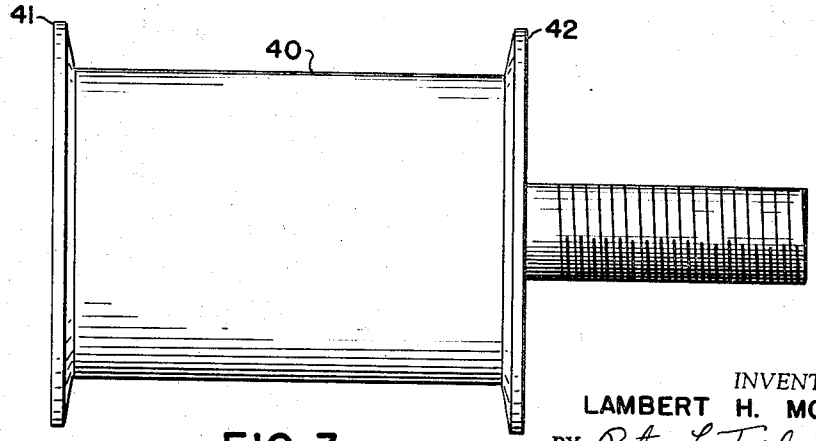


FIG. 3

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This invention relates in general to rollers used in textile machinery known as separator rolls over which filaments pass; and, more particularly, to air supported rollers of this type.

Rollers of many types are used in textile machines to guide or pass filaments thereover. If conventional ball or roller bearing supported rollers are used, they require lubrication which may fly off or drip to stain textile products being produced. Also, conventional bearings wear out and must be replaced after a period of operation because, although the loads are light, high speed rotation is involved. Air supported or air lubricated rollers have been used, but these rollers have required such large volumes of air and so many rollers are used in textile machines that maintaining a sufficient supply of pressurized air presented difficulties and was not economically feasible.

It is, therefore, a main object of this invention to provide an air roller for use on a textile machine which has a minimum air supply requirement.

Another object of this invention is to provide an air roller for a textile machine which has the lowest possible inertia.

A further object of this invention is to provide an air roller for a textile machine which is less expensive to manufacture.

Many other objects, advantages, and features of invention reside in the particular construction, combination, and arrangement of parts involved in the embodiment of my invention and its practice as will be understood from the following description and accompanying drawing wherein:

FIGURE 1 is a longitudinal section through an air roller according to my invention;

FIGURE 2 is an end view of the air roller of FIGURE 1; and

FIGURE 3 is a side view of another air roller which may be fabricated according to this invention.

Referring to the drawing in detail, an air roller according to my invention has a stem **10** which is machined to leave a larger diameter collar **11** at one end of a smaller diameter shaft **12**. A threaded extension **14** is used to mount stem **10** and supply pressurized air to the roller. An air passage **15** is bored in extension **14** to meet the transverse aperture **16** drilled through shaft **12**.

A porous metal cylinder **20** is formed to contain a central passage **21** of substantially the same diameter as collar **11**. Passage **21** extends substantially the length of cylinder **20** to terminate in a smaller portion **22** which is of substantially the same diameter as shaft **12**. Thus stem **10** may be pressed into cylinder **20** leaving a central compartment **24** which is supplied with compressed air through passage **15**.

Cylinder **20** is formed of porous metal, preferably porous stainless steel to minimize corrosion. It should be formed from a metal powder with a grain size less

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than .001" compacted to have a porosity of less than 20 percent. This results in a cylinder **20** of low permeability which restricts the flow of air from compartment **24** to the outer surface **25** of cylinder **20** and to its ends **26** and **27**.

A tubular shell **30** has an end plate **31** crimped in one end. Plate **31** contains an air escape aperture **32**. At least one flange **33** is formed on shell **30** to guide filaments passing thereover. A second end plate **34** is fixed in shell **30** by means of a retaining ring **35** which expands into an inner groove **36**. End plate **34** contains a central opening **37** which extends with a slight clearance **38** about collar **11** to allow the escape of air. Thus it may be seen that air introduced into passage **15** will escape through cylinder **20** to float and longitudinally position shell **30** so that it may rotate freely.

To operate satisfactorily with a minimum flow of air, shell **30** should have a radial clearance of less than .001" from the outer surface **25** of cylinder **20**. However, the end plates **31** and **34** should be, between them, a total distance of more than .005" from the end surfaces **26** and **27** of cylinder **20**. If the sum of the clearances between the end plates **31** and **34** and the surfaces **26** and **27** is less than .005", an undesirable longitudinal vibration will be set up in the shell **30** during operation of the air roller.

The shell **30** may rotate at 15,000 r.p.m. so that inertia on rapid starting and stopping is an important factor. Thus shell **30** and end plates **31** and **34** are made as thin and light as possible to reduce inertia and prevent filament breakage and distortion.

FIGURE 3 shows a roller **40** similar to that described which has two guide flanges **41** and **42** formed on it. These rollers, as shown in FIGURES 1 and 3, are known as separator rollers in the textile trade and are from .75" to 2" in diameter and from 1" to 8" in length. The air roller of this invention is inexpensive to manufacture and it is economical in its use of air. As one example, an air roller built according to this invention was .825" in diameter with a porous cylinder **20** .75" in diameter. This roller was 2" long. The roller required air at a pressure of 10 p.s.i. to rotate and, at this pressure, used 100 cc. of air per minute. At 15 p.s.i., it used 140 cc. of air per minute; at 20 p.s.i., it used 170 cc. of air; at 25 p.s.i., it used 220 cc. of air; at 30 p.s.i., it used 250 cc. of air. Thus it may be seen that the air roller of this invention operates at a wide range of pressures with a minimum air consumption.

While this invention has been shown and described in the best form known, it will be understood that this is purely exemplary and that modifications may be made without departing from the spirit and scope of the invention except as it may be more limited in the appended claims wherein I claim:

1. An air roller for textile machines for passing filaments thereover, said air roller comprising, in combination, a stem having a shaft portion, a cylinder with flat ends and a porous metal disposed about said shaft portion of said stem forming a compartment between said shaft portion and said cylinder extending substantially the length of said cylinder, said stem containing an air passage communicating with said compartment, said cyl-

inder being formed from a metal powder with a grain size less than .001" compacted to have a porosity less than 20 percent, and a thin shell having at least one guide flange and extending about said cylinder with a radial clearance less than .001", said shell having a first end plate with a central air escape aperture and a second end plate containing an aperture through which said stem extends with a clearance to allow the escape of air, the sum of the distances between said end plates and the ends of said cylinder being greater than .005".

2. The combination according to claim 1 with the addition of a collar at one end of said shaft portion of said stem, said cylinder extending about said shaft portion at the end opposite said collar, said cylinder being bored out substantially its entire length the same diameter as said collar forming said compartment which is closed at one end by said collar.

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