United States Patent

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[54] **FABRIC CUTTING APPARATUS**
1 Claim, 2 Drawing Figs.

[52] **U.S. Cl.** **83/109,**
83/123, 83/459, 83/571, 83/588, 192/131
[51] **Int. Cl.** **B26d 7/02,**
B26d 5/12
[50] **Field of Search** 83/905,
639, 459, 571, 588, 111, 123, 109; 192/131;
279/1M

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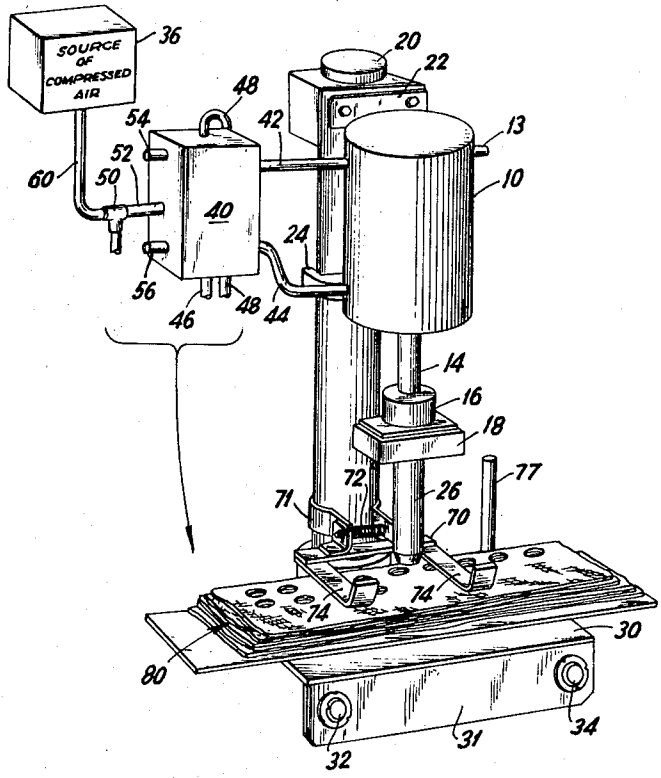
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ABSTRACT: Fabric disc cutting pneumatic apparatus includes a double acting cylinder for operating a cutting member secured thereto by a magnetic chuck. The fabric is retained in place under urging of a spring biased clamp, and cut into discs when a cylinder actuating valve detects the coincident enabling of two spaced, manually operated controls.



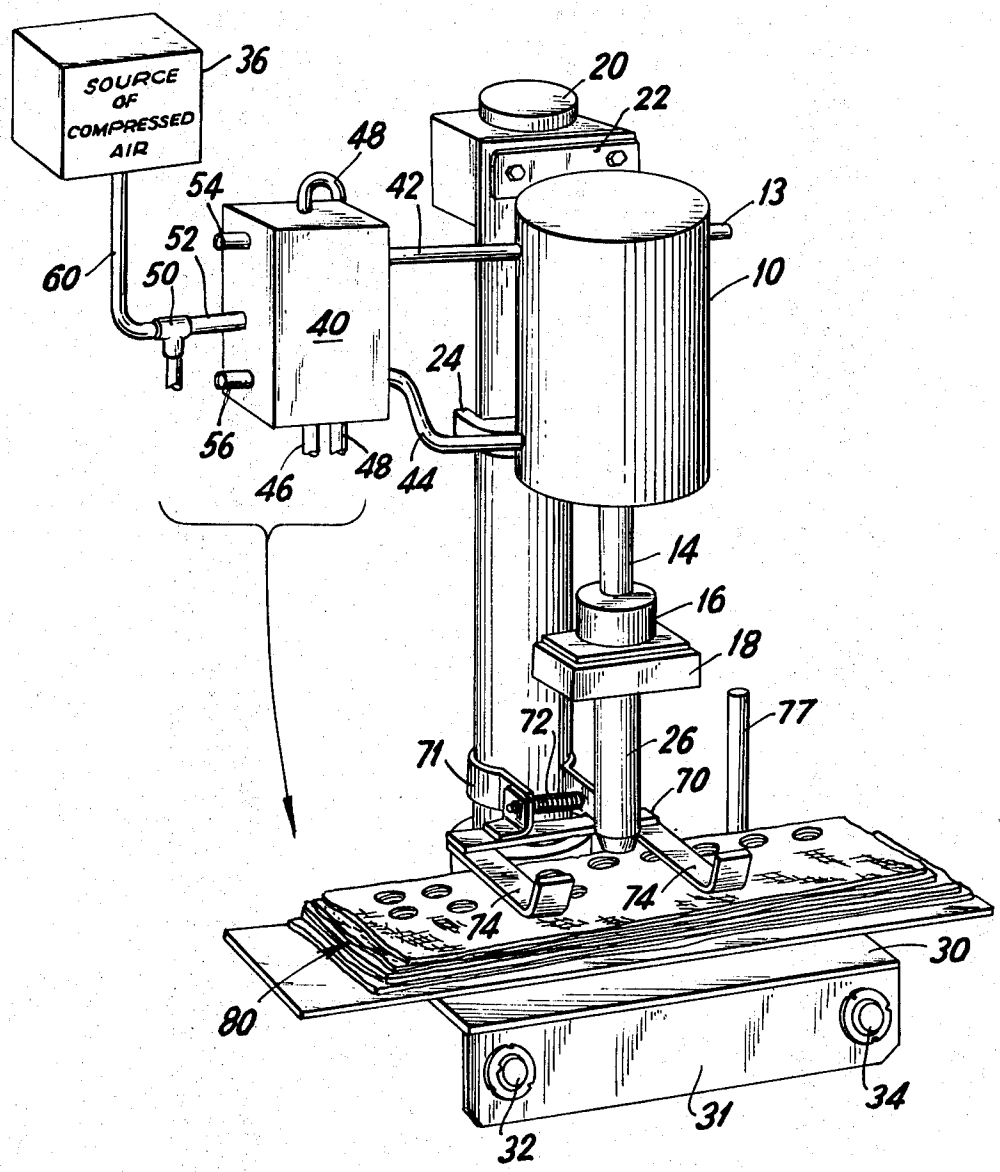


FIG. 1

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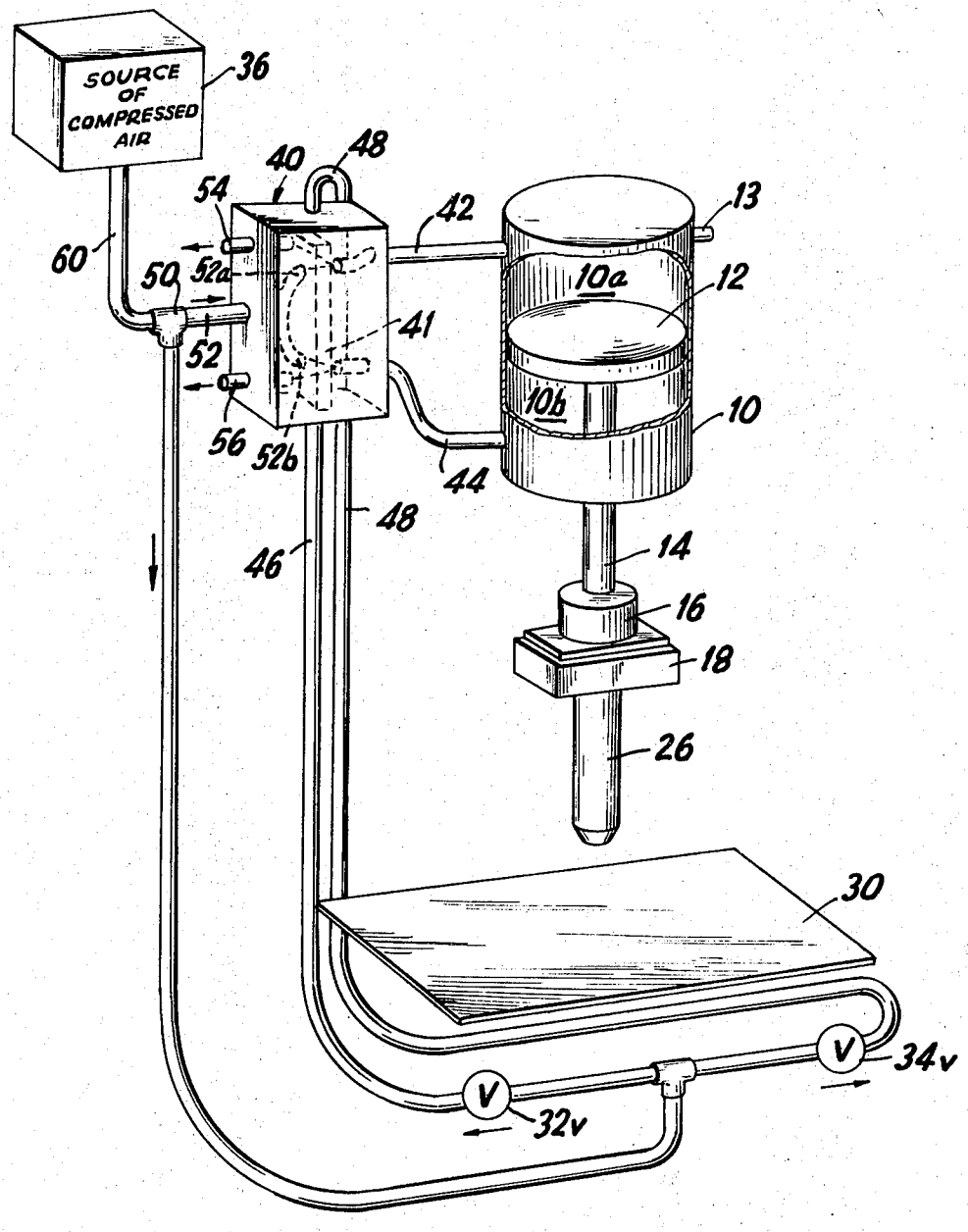


FIG. 2

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FABRIC CUTTING APPARATUS

DISCLOSURE OF INVENTION

This invention relates to fabric processing machines and, more specifically, to an improved apparatus for cutting disc, wafer or other patterns out of natural or synthetic fabrics.

In many applications of present day interest, relatively small segments of varying materials must be fabricated. For example, annular discs of cloth, plastic, felt, vinyl or the like are required to cover buttons for clothing, upholstering and other applications.

It is desirable that machinery operatively producing such button covering discs have readily interchangeable active cutting tools such that discs for covering buttons of varying dimensions may be readily prepared and, moreover, prepared from a given lot of fabric. Further, provision should be made for rapidly and efficiently extracting the fabric discs from the cutting tool or other disc repository.

As a safety feature, the machine operator should be required to position his hands without the cutting zone before a cutting machine cycle can be initiated. This, in turn, gives rise to the necessity for a clamp or other mechanical bias to hold fabrics of varying thickness, and assembled in a varying number of layers, in place in the cutting zone since the hands of the operator are not available for this purpose. However, an improved button covering, disc producing apparatus embodying the above-described advantages has heretofore not been available.

It is therefore an object of the present invention to produce an improved fabric disc cutting apparatus.

More specifically, it is an object of the present invention to provide a disc cutting arrangement wherein active cutting members of varying dimensions are readily interchanged, and wherein the fabric discs are easily extracted from the cutting members.

It is a further object of the present invention to provide a disc cutting apparatus which requires the placement of both the operator's hands at locations away from the cutting zone before a cutting cycle can commence, and wherein biasing apparatus is provided to accept and secure varying thicknesses of fabric in the cutting zone.

These and other objects of the present invention are realized in a specific, illustrative disc cutting apparatus which includes a double acting air cylinder having a translating rod therein. The rod has mounted on the lower end thereof a magnetic chuck to which is adhered by attractional forces a cutting cylinder of a desired diameter. A torsion spring biases a cloth assemblage in place beneath the cutting cylinder.

Two spaced valve actuating buttons are disposed away from the operative cutting zone. Valve apparatus is provided to drive the cutting cylinder through the cloth when the operator simultaneously depresses both buttons. The prepared discs may then be accumulated by pressing the cutting cylinder over an ejector rod.

A complete understanding of the present invention and of the above and other objects, features and variations thereof may be gained from a consideration of the following detailed description of an illustrative embodiment thereof presented hereinbelow in conjunction with the accompanying drawing, in which:

FIG. 1 is a perspective view of a specific illustrative disc cutting apparatus embodying the principles of the present invention; and

FIG. 2 schematically illustrates selected pneumatic apparatus depicted in FIG. 1.

Referring now to FIGS. 1 and 2, there is shown an illustrative disc cutting apparatus which includes a double acting air (or other fluid) cylinder **10** mounted on a vertical main frame support member **20** via upper and lower clamps **22** and **24**. A rod **14** is disposed in part in the air cylinder **10** and adapted for vertical axial translation therein.

An annular cup **12** is mounted on the upper end of the rod **14**. The cup **12** extends to, and makes sealing contact with the inner diameter of the cylinder **10**, and effectively divides the cylinder **10** into upper and lower pneumatic compartments **10*a*** and **10*b***. A chuck block **16** is mounted on the bottom of the rod **14**, and a plate **18** exhibiting magnetic properties is affixed to the block **16**. A cutting cylinder **26** having a sharp lower periphery corresponding in inner diameter to the size of the desired fabric disc is selectively attached to the plate **18** via magnetic interaction.

The main frame rod **20** is affixed to a frame plate **30** having an orthogonal front panel portion **31** on which are located two spaced valve actuating buttons **32** and **34**. Mounted on the rod **20** near the plate **30** is a clamp **70** which comprises two protruding arms **74** biased downward by a torsion spring **72**. The composite clamp **70** is attached to the rod **20** by a bracket **71** which may advantageously be adjustably secured at any desired point along the length of the rod **20**. A stacked array **80** of sheets of fabric to be cut into discs is held securely in place on top of the frame plate **30** by the downwardly biased arms **74**. Alternatively, a solid sheet, for example, wood, may be disposed intermediate the fabric **80** and the frame **30**.

The upper and lower cylinder compartments **10*a*** and **10*b***, and a source of compressed air **36** are respectively connected to a valve **40** by way of conduits **42**, **44**, and via conduits **60** and **52** and a "T" section **50**. The valve **40** also contains a control spool **41**, two conduits **54** and **56** vented to the atmosphere, and two control pilot conduits **46** and **48**. Many embodiments of the valve **40**, illustrated schematically in FIG. **2**, will be apparent to those skilled in the art from the functional description thereof. One such valve is the VPP-4302 valve manufactured by the Versa Company, Englewood, New Jersey.

When the pilot conduit **46** is being supplied with compressed air, or has been so supplied after the other pilot **48** was last energized, the movable spool **41** resides in a stable, vertically raised position. Accordingly, the passageway relationship between the spool **41** and the surrounding cavity in the valve **40** is such as to connect the upper air cylinder conduit **42** to the atmospheric venting conduit **54**, and to connect the lower air cylinder compartment **10*b*** to the pressure source **36** through a completed path comprising the conduits **44**, **52*b*** and **60**, and the "T" section **50**. When these conditions prevail, the pressurized lower cylinder compartment **10*b*** and vented upper compartment **10*a*** generate an upward force on the cup **12**, and drive the cylinder rod **14**, the magnetic chuck assembly **16—18**, and the cutting cylinder **26** to a fixed, upward position above the cloth **80**.

Conversely, when the pilot **48** becomes energized and the pilot **46** deactivated, the spool **41** in the valve **40** moves to a downward position, thus pressurizing the upper cylinder compartment **10*a*** and venting the lower compartment **10*b***. This drives the cup **12**, rod **14**, chuck **16—18** and air cylinder **26** downward. Accordingly, the cutting edge of the cylinder **26** is driven through the fabric layers **80**, and the formed discs penetrate into the interstices of the hollow cylinder **26**.

The valve **40** is controlled by a normally open valve **32*v*** and a normally closed valve **34*v*** which are, in turn, respectively actuated by the buttons **32** and **34** on the main frame panel **31**. In particular, when neither button **32** nor **34** is depressed, the normally open valve **32*v*** passes air from the source **36** to the pilot **46**, while air is blocked from reaching the pilot **48** by the normally closed valve **34*V*** Accordingly, as above described, this results in the chambers **10*a*** and **10*b*** being respectively vented and energized, and the cutting cylinder **26** residing in a raised position. If only one of the buttons **32** or **34** is pushed, both of the pilots **46** and **48** will be inert or energized, depending upon the particular button depressed. The forces on the spool **41** will be balanced in either case, and the normal frictional inertia of the spool will prevent any movement thereof. Accordingly, the cutting cylinder will remain raised.

When the buttons **32** and **34** are coincidentally depressed, the valve **34*v*** opens to activate the pilot **48** while the valve **32*v*** closes to deactivate the pilot **46**. Hence, the spool **41** is driven downward, the chamber **10*b*** is vented, and the chamber **10*a***

pressurized to drive the cutting cylinder **26** through the fabric **80**. When the buttons **32** and **34** are released, the valves **32***v* and **34***v* return to their quiescent state, and the cutting cylinder **26** rises. In addition, I have found that the operation of the valve **40** and the movement of the cup **12** and the rod **14**, are aided by the inclusion of a bleeder orifice **13** in the upper cylinder compartment **10***a*.

To summarize the operation of the disc cutting apparatus of FIGS. **1** and **2** during a production cycle, it is observed that the cup, rod and chuck **12**, **14** and **16—18** initially reside in their quiescent, raised position. The operator may safely insert several stacked layers of fabric **80** beneath the arms **74** of the clamp **70** at this time. He then selects the proper size cutting cylinder **26** and places it against the magnetic plate **18** which retains the cylinder **26** by magnetic action.

The operator next simultaneously depresses both buttons **32** and **34**, thus driving the cutting cylinder **26** through the fabric **80**. The buttons are spaced a sufficient distance apart to require the use of both the operator's hands for coincident action, thus assuring that his hands are safely away from the cutting zone when the cylinder **26** is driven downward. When both buttons are released, the cylinder **26** rises, with the fabric discs inside it. By moving the fabric, and repetitively pushing the buttons **32** and **34**, a large number of discs may be accumulated within any cutting member **26**.

When desired, the operator pulls the filled, or partially filled cylinder **26** away from the plate **18**, and replaces it with a different member **26** of the same or a different size to produce additional discs from the engaged fabric. Alternatively, at any point in production, the operator can change the fabric by simply raising the clamp fingers **74** against the urging of the spring **72**, and insert new material.

When the desired number of discs have been accumulated within any cylinder or cylinders **26**, the operator removes the cylinder from the chuck **16—18** and pushes the cylinder over an ejecting rod **77** affixed to the plate **30**. This forces the discs out of the remote end of the cylinder **26** whereupon the discs may be readily collected and accumulated.

Thus it is seen that button covering discs may advantageously be fabricated in a rapid, efficient, and safe manner by the organization depicted in FIGS. **1** and **2**.

It is to be understood that the above-described arrangement is only illustrative of the principles of the present invention. Numerous modifications and ramifications thereof will be readily apparent to those skilled in the art without departing from the spirit and scope of the present invention. For example, several cutting cylinders **26** may be simultaneously mounted on the magnetic plate **18** to increase the disc production rate. Moreover, the cylinders may be of varying sizes to effect any desired mix of fabric segments.

I claim:

1. In combination in cutting apparatus, pneumatic cylinder means, a piston adapted to selectively translate through said cylinder means, a rod connected to said piston, a magnetic chuck affixed to said rod, first and second conduits connected to said cylinder on opposite sides of said piston, a source of compressed air, control valve means connected to said first and second conduits, said control valve means including venting means, spool means, and an input port connected to said compressed air source, said spool means including means for supplying air to said first conduit and venting said second conduit when in a first position and for supplying air to said second conduit and venting said first conduit when in a second position, third conduit means including normally open valve means connected to said control valve means for quiescently biasing said spool means to its first position, fourth conduit means including normally closed valve means connected to said control valve means for selectively switching said spool means to its second position when both of said normally open and normally closed valve means are actuated, hollow cutting means selectively affixed to said magnetic chuck and having a cutting orifice, an ejector rod fixedly secured to the frame of the machine and adapted to fit within said cutting orifice to facilitate manual ejection of the cut pieces, and spring biased clamp means for securing work material in an operational relationship with said cutting means.