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Norton et al.

[11] **3,837,640**

[45] **Sept. 24, 1974**

[54] **STRIPPER FINGER WITH AIR CUSHION**

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[73] Assignee: **Xerox Corporation,** Stamford, Conn.

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[52] **U.S. Cl.** **271/174,** 271/195, 271/DIG. 2

[51] **Int. Cl.** **B65h 29/56**

[58] **Field of Search** 271/DIG. 2, 80, 51, 74, 271/174, 195; 355/3

[56] **References Cited**

UNITED STATES PATENTS

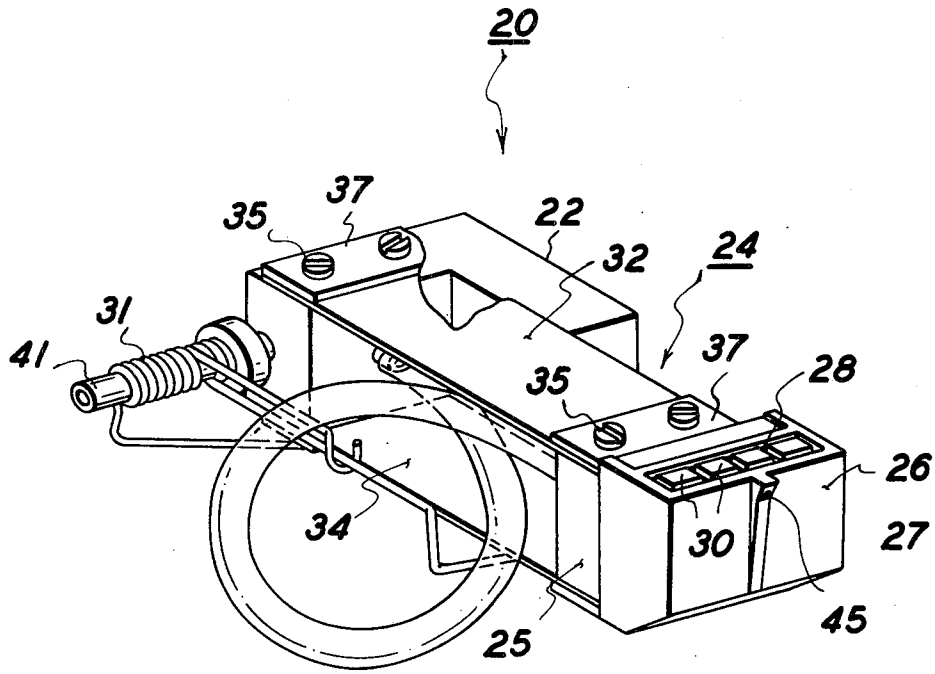
1,595,478	8/1926	Minton	271/DIG. 2
3,126,200	3/1964	Rehm	271/74 X
3,396,235	8/1968	Button et al.	355/3 X
3,578,859	5/1971	Stillings	271/DIG. 2

Primary Examiner—Richard A. Schacher
Assistant Examiner—Bruce H. Stoner, Jr.

[57] **ABSTRACT**

A stripping apparatus for stripping copy sheets from the surface of the xerographic drum without destroying the developed latent electrostatic image on the copy sheet and without contacting the drum surface. A stripping finger is mounted on a linkage which is supported from the machine frame to position the finger in close proximity with the drum surface. The finger has a tip portion which protrudes slightly past the point of tangency of the finger with the drum surface. Small apertures are formed at the bottom of the finger which is hollow and is in communication with an air supply to cause an air cushion to be formed under the finger. The finger floats on an air cushion which is maintained at a predetermined distance from the drum surface. By virtue of the position of the tip with the drum surface, stripping of the leading edge of copy sheets to be stripped from the drum surface is accomplished without contacting the drum surface. A tiny channel formed in the forward surface of the tip is in communication with the air supply and provides sufficient pressure to blow developer material away from the tip to maintain it in clean condition. The linkage is arranged to exert a pressure biasing action on the finger in the direction normal to the direction of drum movement.

5 Claims, 5 Drawing Figures



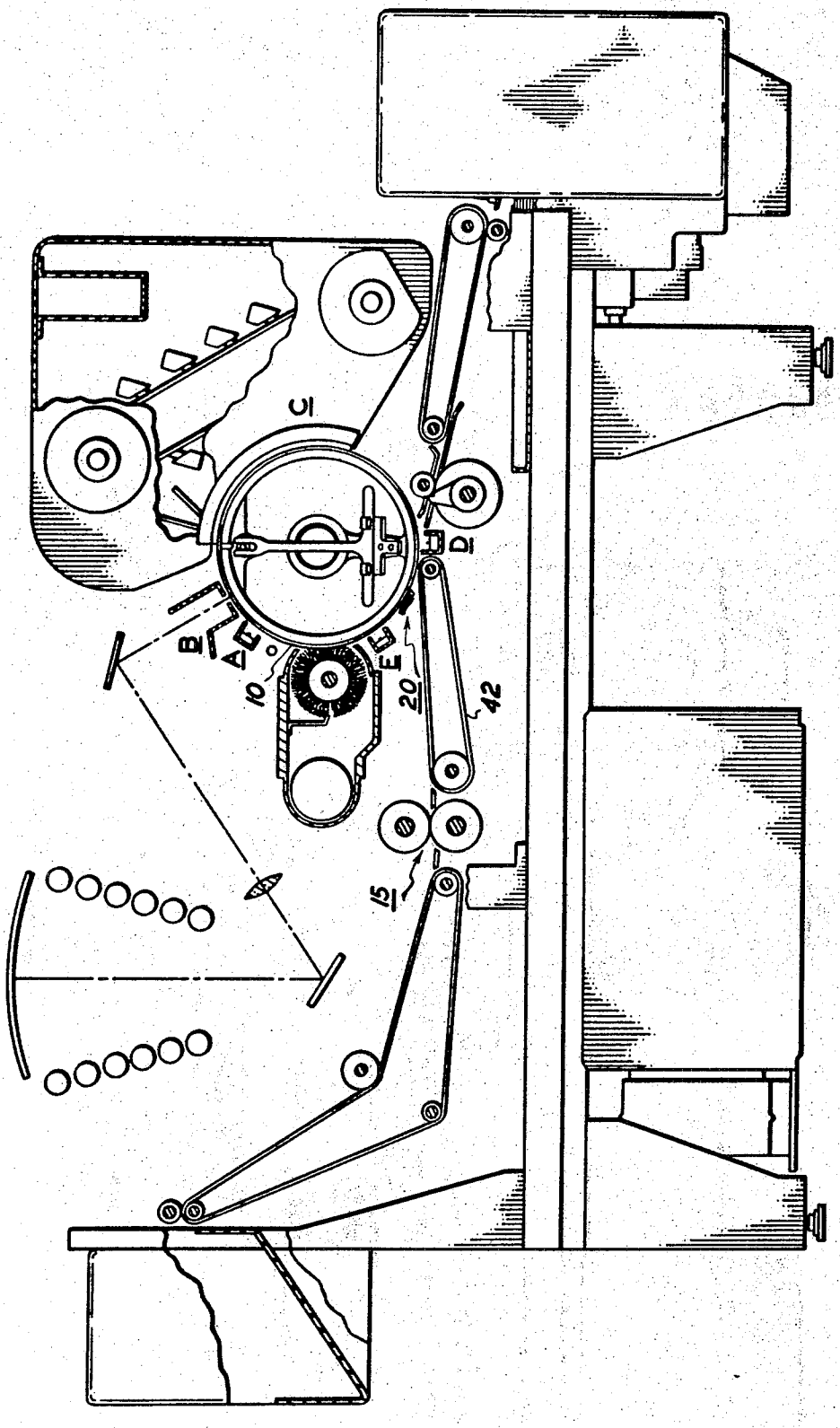
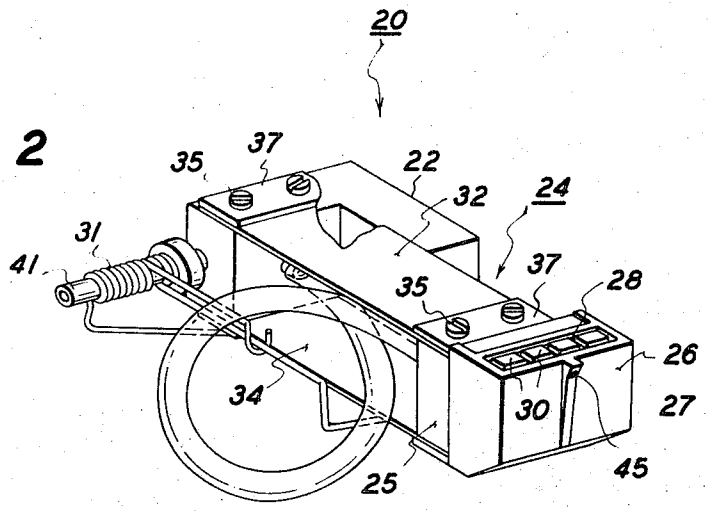


FIG. 1

FIG. 2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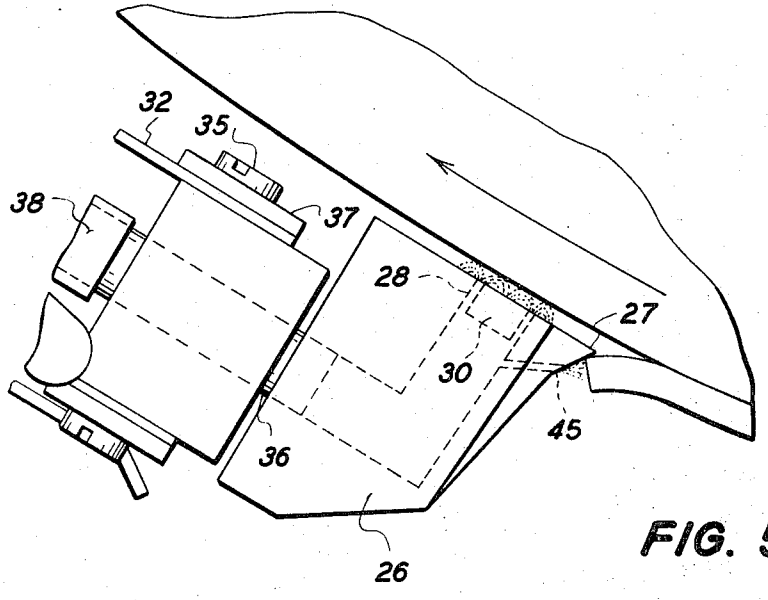
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FIG. 5

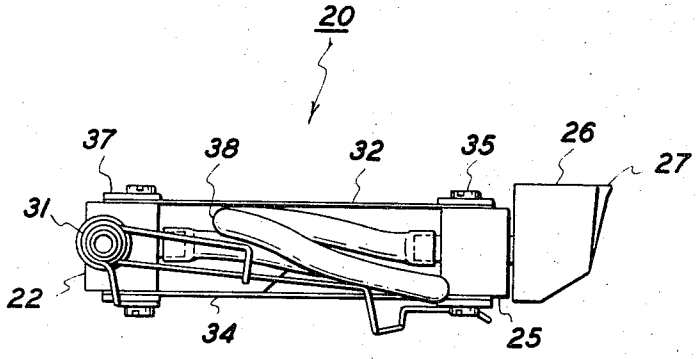

FIG. 3

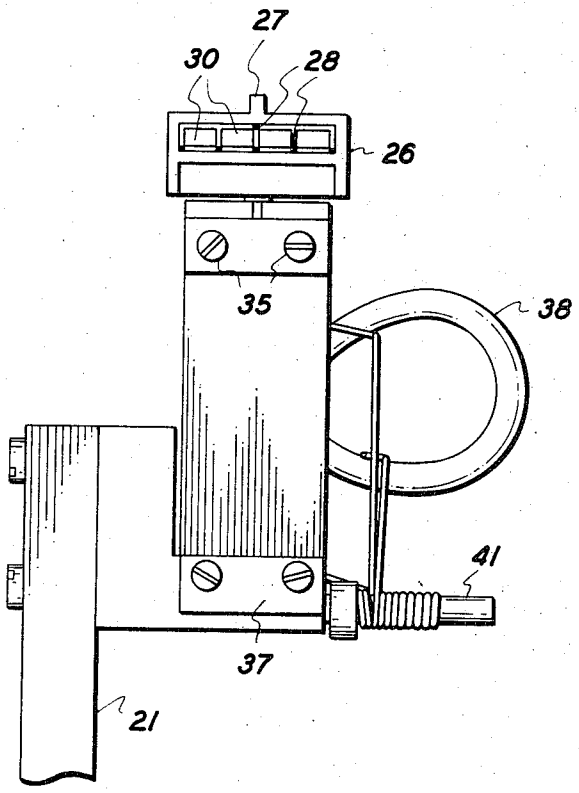

FIG. 4

STRIPPER FINGER WITH AIR CUSHION

This invention generally relates to xerography, and, in particular to an improved apparatus for stripping a paper support material having an electrostatically transferred toner image thereon from a moving photoconductive surface.

In conventional xerography, a photoconductive surface is uniformly charged and the charged surface then exposed to a light image of an original to be reproduced. Under the influence of the light image, the charge on the surface is selectively dissipated to produce what is known as a latent electrostatic image. The charged latent image is developed, or made visible, by attracting oppositely charged toner particles which are brought into close proximity to the plate surface, into the image areas. The developed image is then generally transferred to a paper support material and the image affixed thereto to form a permanent record of the original document.

The copy sheet is placed over the image bearing photoconductive surface and the backside of the sheet subjected to a spray of ionized air. A charge is built up on the sheet having a magnitude and polarity sufficient to electrostatically attract the toner particles from the photoconductive surface to the copy sheet. However, during transfer, a charge opposite to the charge found in the non-imaged areas on the drum surface is induced in the paper causing the copy sheet to become electrostatically tacked to the drum surface. Removal of the copy sheet and the toner image loosely adhering thereto has long been a problem in the xerographic art.

One of the best known and most widely used stripping devices is the mechanical air puffer. The copy sheet is stripped from the surface by introducing a stream of air between the copy sheet and the surface and then allowing the sheet to fall away from the photoconductive surface where it can be picked up by a transport belt or the like. While puffing devices are satisfactory in some respects, they are not entirely reliable in operation.

Another stripping device is an array of mechanical fingers which are actuated by an electrical signal into contact with the photoconductor surface so as to contact the paper edge and wedge the edge away from the photoconductive surface. Normally these stripping fingers are made out of plastic materials or are plastic coated to prevent scoring or abrading the photoconductive surface. It has been found, however, that due to contact with the drum surface that the fingers wear quickly requiring frequent replacement due to the fact that they cannot remain in their sharp configuration which is necessary for the wedging effect. An example of a mechanical stripping finger is described in U.S. Pat. No. 3,578,859. The present invention is an improved stripping finger over existing stripping fingers and in particular is an improvement over copending application Ser. No. 247,064, filed Apr. 24, 1972, entitled Stripper Finger and commonly assigned herewith.

It is therefore a primary object of this invention to improve apparatus for removing an electrostatically tacked image bearing support material from a moving photoconductive surface.

It is a further object of this invention to remove electrostatically tacked copy sheet from a moving photoconductive surface without scoring or abrading the surface.

It is a further object of the present invention to effect greater reliability in stripping copy sheets from photoconductive surfaces.

It is still a further object of the present invention to provide a simplified design and construction for a stripping finger which does not contact the photoconductive surface.

It is yet another object of this invention to prevent developer material from accumulating on the tip of a stripping finger stripping copy sheet from a xerographic drum surface.

It is yet another object of the invention to produce an inexpensive manufacture and assembly for mechanically stripping copy sheets from a photoconductive surface.

These and other objects as well as other features of the present invention are attained by positioning a single elongated finger with one of its surfaces close and nearly tangent to the drum surface and its tip protruding beyond the apparent point of tangency. Spacing between the finger and the drum surface is maintained by an air cushion and a preload against the finger by a spring force.

For a better understanding of the present invention as well as other objects and features thereof, reference is had to the following detailed description of the invention to be read in connection with the accompanying drawings, wherein:

FIG. **1** iillustrates schematically a xerographic reproducing apparatus employing a preferred embodiment of the paper stripping assemby of the present invention;

FIG. **2** is an isometric view of the stripping assembly of the invention;

FIG. **3** is a side sectional view of the stripping assembly shown in FIG. **2**;

FIG. **4** is plan view of the stripping assembly; and

FIG. **5** is an enlarged side elevation of the stripping assembly illustrating the operation thereof.

For a general understanding of the illustrated copier reproduction machine in which the invention is incorporated, reference is had to FIG. **1** in which the various system components for the machine are schematically illustrated. As in all electrostatic systems such as a xerographic machine of the type illustrated, a light image of a document to be reproduced is projected onto the sensitized surface of a xerographic plate to form an electrostatic latent image thereon. Thereafter, the latent image is developed with an oppositely charged developing material to form a xerographic powder image, corresponding to the latent image on the plate surface. The powder image is then electrostatically transferred to a support surface to which it is fused by a fusing device whereby the powder image is caused permanently to adhere to the support surface.

In the illustrated machine, an original to be copied is placed upon a transparent support platen P fixedly arranged in an illumination assembly and image rays are projected by means of an optical system for exposing the photosensitive surface of a xerographic plate in the form of a drum generally indicated by the reference numeral **10.**

The drum **10** is mounted upon the frame of the machine and is adapted to rotate in the direction of the arrow at a constant rate. During this movement of the

drum, it passes a charging station A where a uniform electrostatic charge is applied to the surface thereof. Next at an exposure station B exposure of the drum surface to the light image discharges the xerographic plate in a latent electrostatic image in image configuration corresponding to the light image projected from the original on the supporting platen. As the drum surface continues its movement, the electrostatic image passes through a developing station C in which there is positioned a developer assembly. The developer assembly deposits developing material to the upper part of the drum whereat the material is directed to cascade over the drum surface in order to provide development of the electrostatic image. As the developing material is cascaded over the drum surface, toner particles in the development material are deposited on the surface to form powder images.

The developed electrostatic image is transported by the drum to a transfer station D whereat a sheet of copy paper is moved at a speed in synchronism with the moving belt in order to accomplish transfer of the developed image. There is provided at this station a sheet transfer mechanism to the developed image on the drum at the station D.

After the sheet is stripped from the drum by a stripping assembly **20,** as will be described more fully hereinafter, it is conveyed to a fuser apparatus generally indicated by the reference numeral **15** where the developed and transferred xerographic powder image on the sheet material is discharged from the apparatus by a belt conveyor to a suitable point for collection externally of the apparatus.

Suitable drive means are arranged to drive the drum in conjunction with timed exposure of an original to be copied, to effect conveying and cascade of toner material, to separate and feed sheets of paper and to transport the same across the transfer station D and to convey the sheet of paper through the fuser apparatus in timed sequence to produce copies of the original.

It is believed that the foregoing description is sufficient for the purpose of this application to show the general operation of an electrostatic copier using an improved stripping apparatus constructed in accordance with the invention. For further details concerning the specific construction of the electrostatic copier, reference is made to U.S. Pat. No. 3,301,126, filed Sept. 30, 1964, in the name of Osborne et al.

Referring now to FIGS. **2–5,** the stripping assembly **20** is connected to the machine frame **21** and comprises a support member **22** on which is mounted a linkage assembly **24** carrying a stripper finger member **26** which serves to strip a sheet of copy paper from the surface of the photoconductive drum in a manner which will become more apparent hereinafter. Linkage assembly **24** comprises a four bar linkage having spring members **32** and **34** secured to the support member **22** and support member **25** by means of screws **35** and plate members **37.** A torsion spring assembly **31** serves to urge the stripper finger **26** into contact with the drum by applying a biasing force on linkage assembly **24.** Mounted on support member **25** is stripper finger member **26,** which has a stripping tip portion **27** extending therefrom. Stripper finger member **26** may be made out of any suitable material, such as, metal, ceramic, and mixtures thereof. A preferred material is Fotoceram, a registered trademark of Corning Glass Works, Corning, N.Y.

In accordance with the invention tiny apertures **28** are formed in segemented portions **30** arranged in the upper surface of the stripper finger member to effect an air cushion between the drum surface and finger member. Stripper finger member **26** is supported on a rigid conduit member **37** received in support member **25** which pivotally supports the stripper finger member on an axis through the conduit member. Connected to conduit member **36** is a flexible tube member **38** which is connected to a conduit member **41** received in support member **22.** Conduit member **41** is connected to a source of pressurized air (not shown). By this arrangement, pressurized air is supplied to the apertures **28** formed in the upper surface of stripper finger member **26** which causes an air cushion to be formed between the surface of the stripper finger member and the drum.

It will be noted that a channel **45** is formed tip portion **27** of the stripper finger member. The purpose of channel **45** is to direct a jet of air along the tip portion to remove any loose developer material therefrom.

In operation, the stripper finger member is supported on an air cushion at a distance ranging from between 0.0005 to 0.0015 inches during the stripping operation which is satisfactory for stripping most paper thickness and weights. The air cushion supports the stripper at a uniform distance from the drum surface due to the action of the springs **32** and **34,** which serve to urge the stripper finger upwardly into contact with the drum surface. Movement of the finger member normal to the drum is effected by pivoting on the axis through conduit member **32.** The tip portion of the stripping finger member extends slightly beyond the point of tangency to the drum surface. In this manner the tip strips the leading edge of the sheet from the drum surface.

It will be appreciated that the stripper finger does not contact the drum surface during the stripping operation, but is held therefrom at a distance which may be adjusted by regulating the air pressure. It has been found that pressure ranging from about 10–12 PSI work well. The finger will not damage or otherwise abrade the drum surface. Moreover, due to the pressurized air acting on the tip portion of the stripper finger, residual toner normally left on the drum surface will not collect on the tip portion which in the past has been responsible for mis-stripping. In addition to these advantages, the stripping finger of the invention has the ability to strip skewed copy sheets from the drum surface. The stripping finger of the present invention is a significant advance in the copying, and in particular, is highly advantageous over the existing stripping devices used in xerographic copying machines.

What is claimed is:

1. In a xerographic copying apparatus for producing multiple copies wherein each developed copy sheet is electrostatically tacked to a moving xerographic drum image bearing surface, an improved stripping apparatus for removing the tacked copy sheet with developed images thereon from the moving drum surface comprising:

a frame,

resilient linkage means arranged in parallelogram fashion pivotally supported on said frame against the action of spring bias means,

a stripper finger member mounted on said resilient linkage means at a distance from a drum surface less than the thickness of each copy sheet to be

stripped, said finger member having a tip portion extending in a linear direction slightly past a point of tangency with the drum surface, said finger member further having an array of apertures formed therein on one surface thereof facing the drum surface, and

air supply means providing low pressure air in communication with the apertures to cause an air cushion to be formed between the finger member and the drum surface acting against said resilient linkage means and spring bias means to maintain uniform spacing therebetween during the stripping operation to enable stripping of the copy sheet with developed images thereon by said tip portion without contacting the drum surface.

2. Apparatus according to claim **1** wherein said tip portion is formed with at least one channel in communication with the air supply means to prevent developer material from sticking thereto.

3. Apparatus according to claim **1** wherein said tip portion is maintained at a uniform distance from the drum surface ranging from about 0.0005 to about 0.0015 inches depending on copy sheet thickness.

4. Apparatus according to claim **1** wherein said stripper finger is pivotally supported on conduit means communicating air thereto.

5. Apparatus according to claim **1** wherein said air pressure ranges from about 10 to about 12 psi.

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