July 6, 1954 A. W. INFANGER 2,682,811

MACHINE FOR SCREENING PAPER STOCK

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Fig. 1

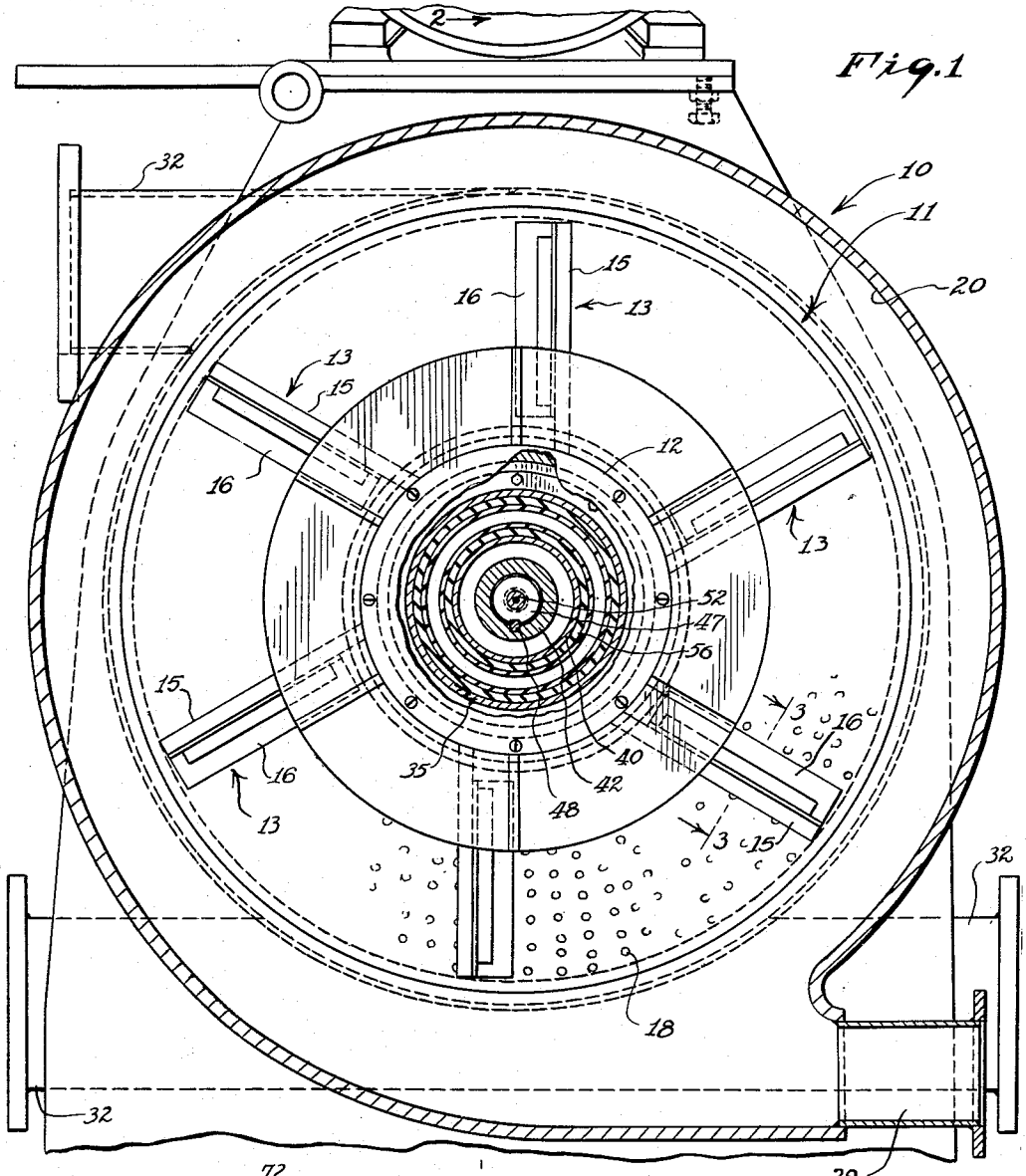

Fig. 3

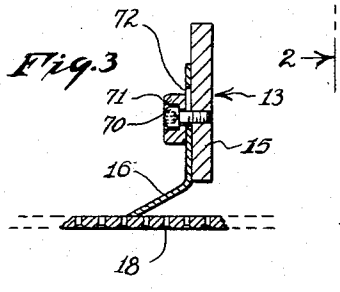

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Fig. 2

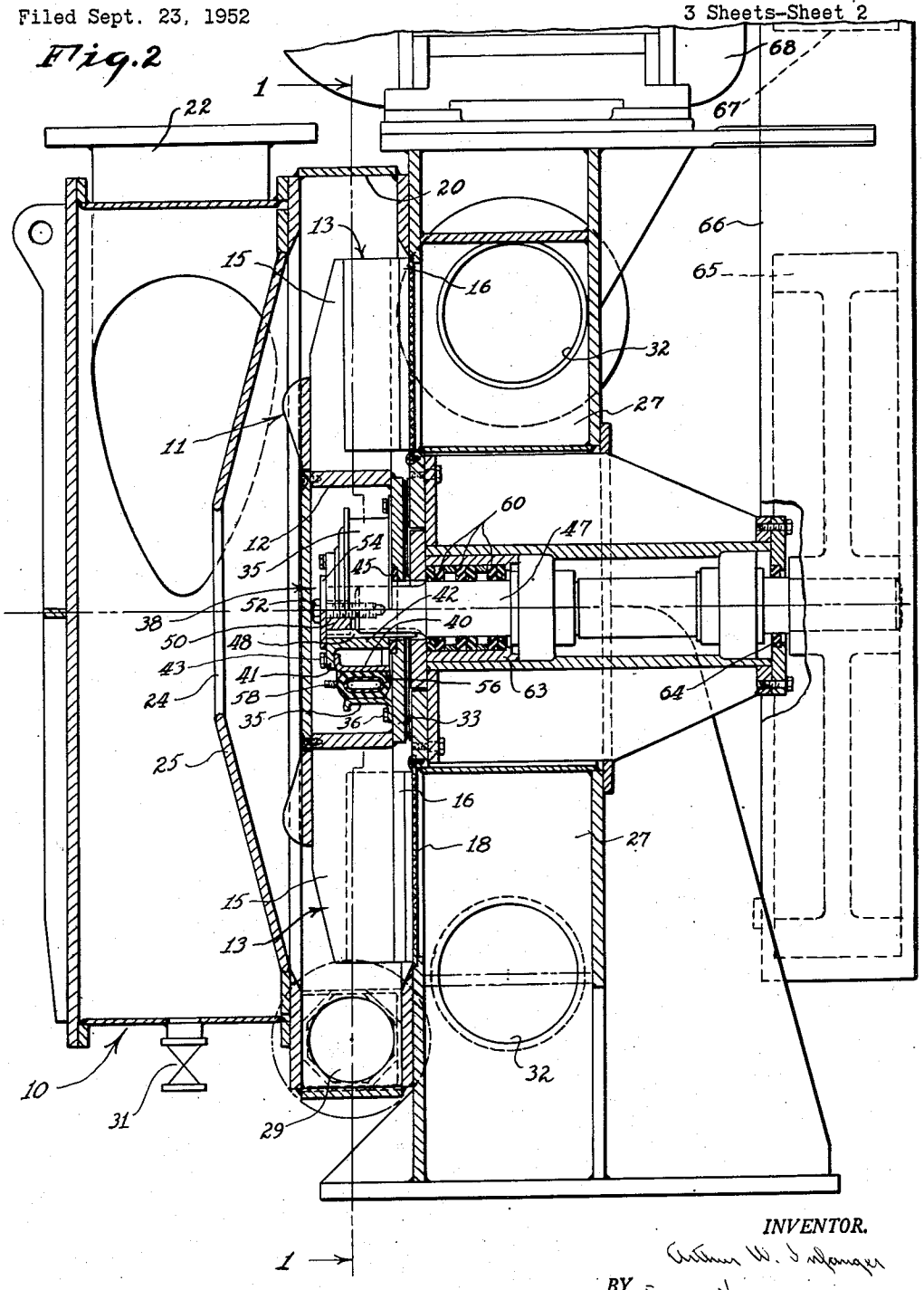

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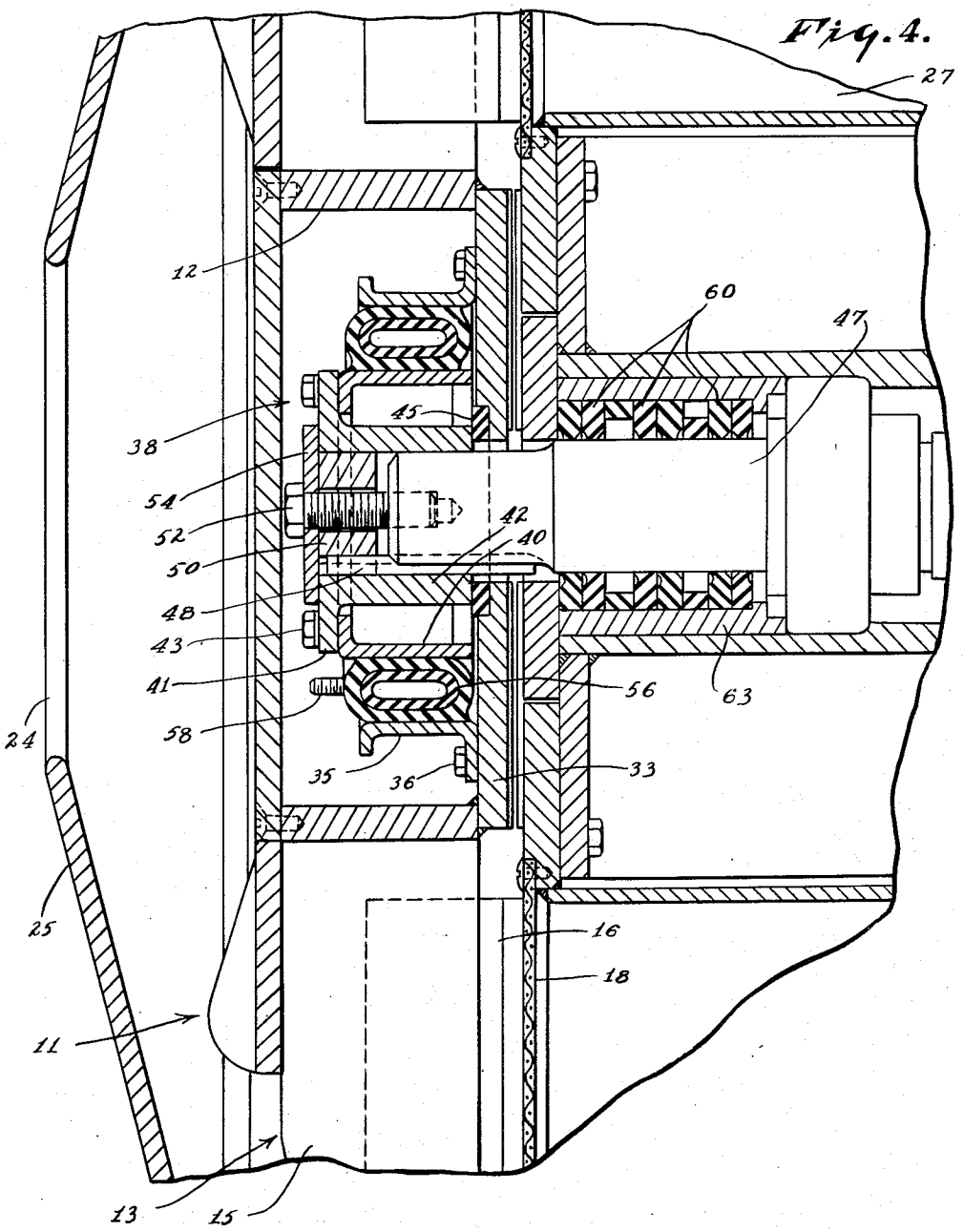
Fig. 4.



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Patented July 6, 1954 2,682,811

UNITED STATES PATENT OFFICE

2,682,811

MACHINE FOR SCREENING PAPER STOCK

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Application September 23, 1952, Serial No. 311,119

6 Claims. (Cl. 92—34)

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This invention relates to machines for screening paper stock and pertains particularly to machines having rotary scrapers which move in contact with the screen and serve to clear the screen perforations.

In such machines it has been a difficult problem to hold the scrapers in yielding contact with the entire screen and to insure that the scrapers remain in contact with the screen throughout their entire rotative movement. The problem is partially one of proper shaft alignment and partially one of proper scraper adjustment, but even with proper alignment and adjustment, their remains the problem of compensation for wear of scrapers and screen. Even under best conditions, it has been found necessary to effect frequent adjustments in order to keep a machine in efficient operating condition.

It is an object of the present invention to provide a flexible coupling between the drive shaft and the hub of the scraper carrier which holds the scrapers in yielding contact with the screen, but at the same time permits the scrapers to adjust themselves to correct for any misalignment or irregularity in the screen surface.

It is a further object of the invention to provide a construction which will compensate for wear and thus maintain proper working contact for long periods without adjustment.

A preferred embodiment of the invention selected for purposes of illustration is shown in the accompanying drawings in which,

Figure 1 is a vertical, sectional view through screening apparatus embodying this invention, the section being taken on the line 1—1 of Figure 2;

Figure 2 is a vertical, sectional view taken on the line 2—2 of Figure 1; and

Figure 3 is an enlarged, detail, sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a view similar to Fig. 2 showing the impeller hub, driving hub, resilient element 56 and the related structure in detail.

The screening apparatus shown in the drawing includes a frame or casing 10 in which there is an open impeller 11 comprising a hub 12 and blades 13.

Each of the blades 13 includes a hub arm 15 to which is attached a scraper 16. In the construction illustrated, the edges of the scrapers 16 extend along radii of the impeller, but for other kinds of impellers the blades may have different shapes and slopes. The terms "radial" and "radially extending," as used in this specification designate blades which extend from a rotor hub away from the axis of rotation regardless of

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whether the blades are straight or curved with respect to radii extending from the axis of rotation.

The blades 13 extend across the face of a screen 18 located at one side of the casing 10. This screen 18 is a stiff, perforated, annular plate which covers a corresponding opening in the wall of the casing, as best shown in Figure 2. This screen 18 is a perforate partition separating the interior of the casing into two chambers, including a first chamber on the left hand side of the screen 18, in Figure 2, and a second chamber on the right hand side of the screen.

The blades 13 do not extend to the peripheral wall 20 of the casing. A suspension of stock enters the casing 10 through an inlet supply pipe 22. This stock flows to the impeller 11 through a center opening 24 in a baffle 25 located in the casing in front of the impeller.

The impeller blades cause the stock to move radially outward in all directions from the opening 24 as the stock moves with a radial component toward the screen 18. Liquid and fibers of small enough size to pass through the screen 18 enter an annular chamber 27 behind the screen 18. Other material which is too large to pass through the screen is removed from a casing through a reject outlet 29 at the bottom of the casing. This prevents the accumulation of trash in the casing, and the impeller blades with their scrapers 16 prevent the accumulation of fibers on the face of the screen 18. A drain 31 at the bottom of the casing, in front of the baffle 25, provides means for removing material that remains in front of the baffle when an operation is completed.

Acceptable stock which passes through the screen 18 into the chamber 27 is discharged from the chamber 27 through outlets 32.

The impeller hub 12 has an inwardly extending flange 33, welded or otherwise integrally secured to the remainder of the hub, and there is a drum 35 attached to the flange 33 by screws 36. In the illustrated construction, therefore, the drum 35 comprises a part of the blade holder of the screening device.

The power for driving the rotor is supplied by a driving hub 38 which includes an inner drum 40 secured to a flange 41, of a sleeve 42, by screws 43. This sleeve 42 has its rearward end face in contact with a resilient packing ring 45, which is preferably made of sponge rubber. The sleeve 42 surrounds a drive shaft 47 and is connected to the drive shaft 47 by a key 48. The key 48 permits axial movement of the sleeve 42 on the drive shaft 47.

The flanged end of the sleeve 42 extends beyond the end of the drive shaft 47 and contains a bushing 50 having a keyway along which the key 48 extends. There is a substantial clearance between the confronting end faces of the drive shaft 47 and the bushing 50, and the amount of this clearance determines the potential adjustment of the drive connection between the drive shaft and the blade carrier. A screw 52 passes through the bushing 50 and threads into the end of the drive shaft 47. This screw 52 clamps a washer 54 against the flanged end of the sleeve 42 and holds the other end of the sleeve in contact with the packing ring 45. When the screw 52 is rotated in one direction it moves the sleeve 42 axially, toward the right in Figure 2, with resulting compression of the ring 45.

The significant effect of this axial adjustment of the sleeve 42 is that the inner drum 40 moves axially with respect to the outer drum 35. Between these drums there is a resilient element 56 which is permanently bonded to the confronting faces of the drums 35 and 40 so as to transmit torque of the drum 40 to the outer drum 35. This resilient element 56 is preferably a rubber tube inflated with fluid under substantial pressure.

In its broadest aspects, and considered generically, the resilient element 56 is a flattened torus which is bonded to the drums 35 and 40. The element 56 can be made of solid, resilient material; but it is a feature of the preferred construction that the element 56 is tubular and provided with a stem 58 through which it can be inflated with fluid.

After the resilient element 56, between the drums 35 and 40, is inflated to exert a substantial pressure against the confronting faces of these drums, the adjusting screw 52 is turned to move the drum 40 axially with respect to the drum 35 of the scraper carrier.

This axial adjustment of the drum 40 shifts the force of the resilient element 56 from a straight, radial compression normal to the axis of the shaft 47, to a direction of tension which slopes slightly with respect to a plane normal to the shaft axis. Thus the force of the resilient element 56 against faces of the drums 35 and 40, has an axial component. The magnitude of this component depends upon how far the drum 40 is displaced axially from its normal position with respect to the drum 35 of the scraper carrier. The greater the axial movement, the greater the axial component of tension and the greater the force with which the scrapers are held against the screen. This force is proportional to the amount of fluid pressure within the torus 56.

The shaft 47 extends through a packing gland 60, and beyond the packing gland the shaft 47 has bearings 62 located in a housing 63.

Beyond the housing 63, shaft 47 extends through other packings 64 and is connected with a pulley 65. The pulley 65 is driven by a belt 66 from a driving pulley 67 of a motor 68. In the construction illustrated the motor 68 is connected to the top of the main frame or casing of the screening device.

Figure 3 is a detail view showing the way in which the scraper 16 is connected to the hub arm 15, of the carrier, by screws 70 extending through a clamping block 71. The scraper 16 has a hardened face which bears against the surface of the screen 18. A substantial amount of wear of the scraper is taken up by the movement of the blade holder toward the screen under influence of the constant pressure exerted axially by the resilient driving element already described in connection with Figure 2. For greater adjustment of the apparatus, from time to time, the scraper 16 is provided with a slot 72 through which the screw 70 extends.

The preferred embodiment of the invention has been illustrated and described, but changes and modifications can be made, and some features of the invention can be used in different combinations without departing from the invention as defined in the claims.

What is claimed is:

1. A screening device including a scraper carrier and a power driven hub, the scraper carrier being rotatable about an axis to rotate its scrapers in front of a screen, and the scraper carrier having bearing surfaces that limit its axial movement in the direction of the screen, the power driven hub being rotatable about substantially the same axis as the scraper carrier, confronting faces on the scraper carrier and power driven hub, the faces being spaced radially from one another and both extending in directions having substantial components parallel to the axis of rotation of the carrier and hub, and a resilient element compressed in the space between the confronting faces and exerting radial thrust against said faces, the face on the hub exerting also an axial component of thrust in the direction of the screen and transmitting said axial component of thrust through the resilient element to the scraper carrier to bias said carrier toward the screen.

2. A screening device comprising a screen, a scraper holder rotatable about an axis, scrapers carried by the holder in position to travel across the surface of the screen as the scraper holder rotates, a bearing on which the scraper holder is movable axially to carry the scrapers closer to the screen as the surfaces of the scrapers and screen wear with continued use, a power driven hub rotatable about substantially the same axis as the scraper holder, said hub being located partially within the scraper holder and having a surface spaced from a confronting surface of the scraper holder in radial directions substantially normal to the axis of rotation of the hub, and a resilient element compressed between the confronting faces of the hub and scraper holder with the compression in a direction having its major component radial and a minor component parallel to the shaft in a direction to urge the scraper holder toward the screen.

3. In a screening device having a screen with a bearing surface on one side, a plurality of scrapers, and a scraper carrier that is axially movable toward and from the screen and that rotates to move the scrapers parallel to the screen at locations adjacent to the screen bearing surface which limits axial displacement of the scraper carrier in the direction toward the screen, other bearing surfaces on which the scraper carrier rotates about an axis, a driving hub that rotates about an axis substantially coincident with the axis of rotation of the scraper carrier, the hub and scraper carrier having confronting faces spaced from one another in radial directions normal to the axis of rotation, a resilient and radially flattened torus element between the confronting faces of the hub and scraper carrier and bonded to said confronting faces, and means that adjust at least one of the confronting faces axially to impart an axial component to the compression of said torus element in a direction to

bias the scraper carrier toward the screen with a resilient pressure.

4. In a screening apparatus as described in claim 3, said torus element comprising a tube and a stem through which fluid is forced into the tube to expand the tube against the confronting faces of the hub and scraper carrier.

5. Screening apparatus comprising a casing having a first and second chamber separated by a partition, at least a portion of which comprises a screen, an impeller in the first chamber comprising a scraper holder and a plurality of radially extending scrapers connected to the scraper holder and located in position to rotate in front of the screen as the impeller turns about an axis, the screen and scrapers terminating short of the periphery of the first chamber to leave a clearance for the accumulation of pieces of material too large to pass through the screen, a drive shaft extending through the casing on the side of the screen with a second chamber, a hub on the drive shaft at least partially enclosed within the impeller, said hub having an outside cylindrical face confronting a corresponding face within the impeller, the confronting faces of the hub and impeller being spaced from one another, a resilient tube filling the space between and bonded to the confronting faces of the hub and impeller, said tube being compressed between said faces in a direction that gives the compression a minor component in directions parallel to the axis of rotation of the drive shaft and impeller, and a bearing surface on which at least

a portion of the impeller is movable axially to thrust the scrapers into contact with the screen in response to the axial component of the compressive forces exerted by said tube.

6. A screening device including a scraper holder that rotates about an axis, scrapers carried by said holder, a screen with which the scrapers contact and across which the scrapers travel as the scraper holder rotates, a driving hub that rotates about an axis substantially coincident with the axis of rotation of the scraper holder, a bearing on which the scraper holder is axially movable to shift the scrapers toward and from the screen, the scraper holder having a face confronting a corresponding face of the driving hub and spaced from the corresponding face of the driving hub in a radial direction normal to its axis of rotation, an inflated tube bonded to the confronting faces of the hub and scraper holder, a screw extending through a portion of the hub and in a direction parallel to the axis of rotation of the hub, a shoulder on said screw in contact with a face of the hub and that shifts the hub axially to shift the inflated tube into position to give its tension force an axial component to press the scraper holder toward the screen.

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