June 26, 1962 H. L. BAUMBACH 3,040,361

SQUEEGEE

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Fig. 1

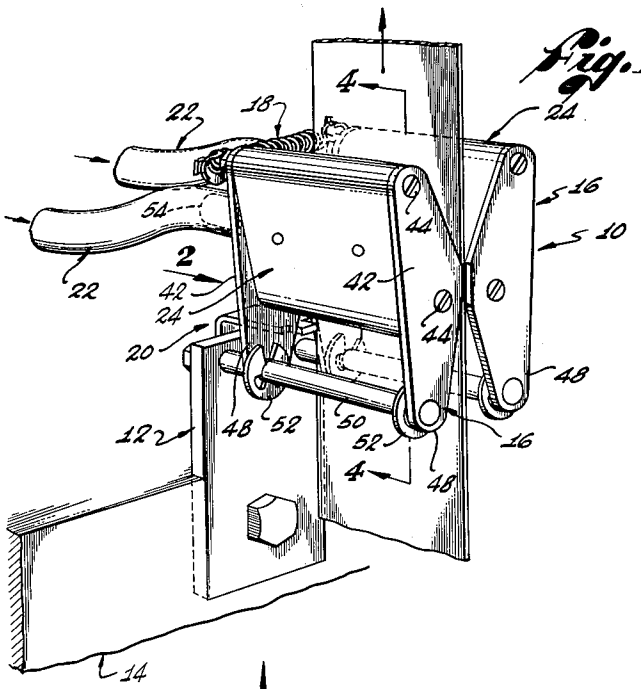


Fig. 2

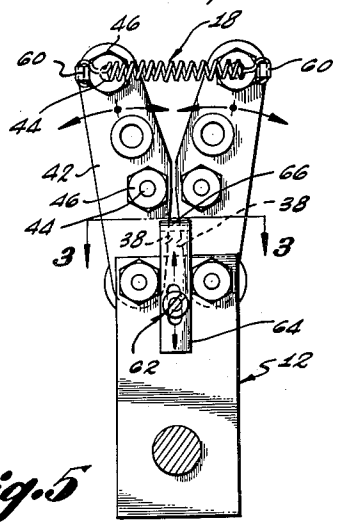


Fig. 4

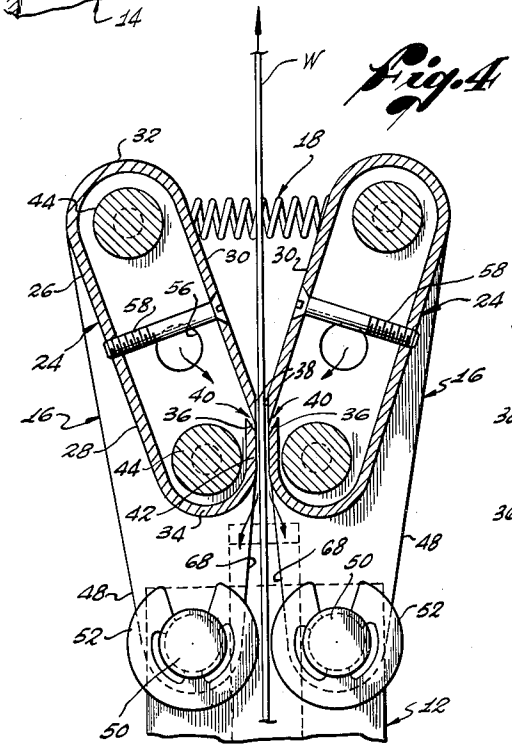


Fig. 5

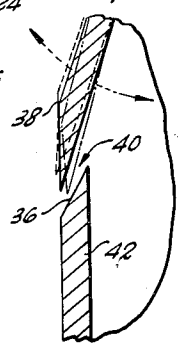
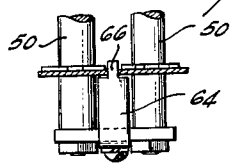


Fig. 3



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SQUEEGEE

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This invention relates generally to squeegees, and particularly, to a fluid squeegee which is characterized by its simplicity of construction, ease of cleaning, lack of precision parts, and economy of manufacture.

Air squeegees are well known in the art and are frequently used to remove liquid, dust, and other contaminants from the surface or surfaces of a moving web. One of the more common applications of an air squeegee is removing moisture, dust, and the like from the surfaces of a motion picture film as the latter emerges from a photographic processing bath. Air squeegees are also commonly used in photographic printers for cleaning the film to be printed prior to passage of the latter past the printing aperture.

The present squeegee is ideally suited to air cleaning motion picture film. It is pointed out, however, and it will be readily understood that the present squeegee is capable of general use for cleaning a continuous web of any material. Moreover, while the following description refers to an "air" squeegee, cleaning liquids may also be used in the squeegee. In the latter case, of course, the squeegee would be more aptly termed a "liquid" squeegee.

Numerous and different types of air squeegees have been developed. One of the most efficient air squeegees is equipped with two squeegee bodies, between which the web to be treated passes, and which are pivotally mounted for movement toward and away from the web. These bodies have, at their opposing sides, long air gaps from which high velocity streams of air discharge toward and along the moving web.

The spacing between the air gaps is adjusted, to accommodate the thickness of the web to be cleaned, by pivotal movement of the squeegee bodies toward or away from one another. The proper air gap spacing is maintained by retaining the squeegee bodies in the proper setting.

A general object of this invention is to provide an improved and relatively inexpensive air squeegee of the character described.

A more specific object of the invention is to provide a squeegee body for an air squeegee of the character described which is simply and inexpensively fabricated from sheet metal.

Another object of the invention is to provide a squeegee body for an air squeegee of the character described which embodies a simple, uniquely formed and adjustable air gap from whence issues the high velocity air stream for cleaning a web and which gap is so arranged that the web being cleaned is maintained out of contact with the squeegee parts by an air cushion.

A further object of the invention is to provide an air squeegee of the character described in which the air gap spacing is adjusted, to accommodate the thickness of the web to be cleaned, in a new and unique manner.

Yet a further object of the invention is to provide an air squeegee of the character described and a squeegee body therefor which comprise a relatively few number of parts which can be readily disassembled and reassembled for cleaning or repair without disturbing the air gap adjustment, are immune to mal-functioning, and are otherwise ideally suited to their intended functions.

Other objects, advantages, and features of the invention will become readily apparent as the description proceeds.

Briefly, the objects of the invention are attained by providing an air squeegee equipped with two squeegee bodies, between which passes the web to be cleaned. These bodies are pivotally adjustable toward and away from one another to vary the spacing between their air gaps for the purpose of accommodating the thickness of the web. Each squeegee body includes an air chamber, having the air gap, which is uniquely and simply formed from a single tubulated metal sheet. The ends of this tubular air chamber are closed by end plates which extend beyond the air chamber to form supporting legs for pivotally mounting the squeegee body on a supporting structure.

The air gap of the squeegee body is uniquely formed between opposing edges of the tubulated metal strip from which the air chamber is formed. A screw extending between walls of this air chamber provides a unique and simple means for adjusting this air gap. The squeegee may be easily disassembled for cleaning or repair and then reassembled without disturbing the air gap adjustment. The air gap is also so designed that a venturi effect is created between the squeegee body and the web being cleaned. This action holds the web in close proximity to but out of contact with the body and provides an air cushion between the web and body.

A better understanding of the invention will be had from the following detailed description thereof, taken in connection with the annexed drawing, in which:

FIG. 1 is a view in perspective of a presently preferred embodiment of the air squeegee of this invention showing a web to be cleaned passing through the squeegee;

FIG. 2 is a view, on somewhat enlarged scale, looking in the direction of the arrow 2 in FIG. 1;

FIG. 3 is a section taken along line 3—3 of FIG. 2;

FIG. 4 is an enlarged section taken along line 4—4 in FIG. 1; and

FIG. 5 illustrates the adjustment of the air gap in the present squeegee.

The illustrated squeegee is denoted in its entirety by the numeral 14. Generally speaking, this squeegee comprises a supporting structure 12 to be mounted on the frame 14 of a web handling machine, two pivotally mounted squeegee bodies 16 which are urged toward one another by a spring 18, an adjustable stop 20 for limiting this pivotal movement of the squeegee bodies, to vary the air gap spacing therebetween, and two air hoses 22 for delivering air under pressure to the squeegee bodies 16.

The squeegee bodies 16 are identical but reversed in position. For this reason, only one of the squeegee bodies will be described, namely, that appearing to the left in FIGS. 1, 2 and 4. Squeegee body 16 comprises an air chamber 24 consisting simply of a tubulated, relatively heavy gauge strip 26 of metal, such as stainless steel. Strip 26 is tubularly formed so as to provide the air chamber 24 with two flat, approximately parallel side walls 28 and 30, a first arcuate, transverse wall 32 which is integrally joined with both side walls 28 and 30, and a second arcuate, transverse wall 34 which is integrally joined only with side wall 28. Transverse wall 34 comprises one end portion of the metal strip 26 from which the air chamber is formed. This transverse wall extends from the side wall 28 around to the opposite side of the air chamber. Transverse wall 34 terminates in an edge face 36 which is inclined at an acute angle to the adjacent inner surface of the strip, as shown.

Side wall 30 of the air chamber comprises the other end portion of the metal strip 26. The adjacent terminal portion 38 of the strip overlaps the edge face 36 in close proximity thereto to define therebetween an air gap 40. The edge face 36, defining one side of this air gap, and the opposing, inner surface of the overlapping terminal portion 38 of the strip 26, which defines the other side of the air gap, converge toward the outside of the air chamber. Air gap 40, therefore, is tapered in the fashion of a

nozzle. Air gap 40, of course, extends endwise of the air chamber.

The terminal portion 42 of the transverse wall 34 is disposed at an obtuse angle with respect to the side wall 30 of the air chamber, as measured between the inner surfaces of these parts. When the air chamber 24 is in its operative position with respect to the web W being cleaned, which position is illustrated in FIG. 4, the terminal portion 42 of the transverse wall 34 is generally tangentially disposed with respect to the web W, while the side wall 30 of the air chamber inclines away from the web, as shown. The air gap 40 directs air toward the web W as well as along the web W in a direction opposing its direction of movement, as indicated by the arrows in FIG. 4.

The open ends of air chamber 24 are closed by a pair of end plates 42. The plates are fixed to the air chamber 24 by screws 44 which extend through the end plates and the air chamber and mount nuts 46 at their ends. These screws and nuts, therefore, clamp the end plates against the open ends of the air chamber 24 and thereby close these ends. The end plates 42 will be observed to have a generally obtuse angled, triangular configuration. The air chamber 24 extends along one edge of these end plates, between one acute corner and the obtuse corner of the plates, with the side wall 30 of the chamber flush with the edge. The air gap 40 of the chamber is aligned with the obtuse corners of the plates, as shown, so as to be positionable in close proximity to the adjacent surface of the web W to be cleaned.

The end plates 42 extend below the air chamber 24 to form supporting legs 48. These legs are somewhat tapered, as shown, because of the triangular configuration of the end plates. Extending through the lower ends of these supporting legs 48 are aligned bores which rotatably receive a supporting shaft 50. One end of this shaft is fixed in the supporting structure 12, as shown. Lock washers 52 secure the supporting legs 48 against axial movement along the shaft 50 but permit pivotal movement of the legs on the shaft.

Rigidly fixed to the end plate 42 adjacent the supporting structure 12 is an inlet nipple 54. This nipple has an inlet passage 56 opening to the interior of the air chamber 24. The hose 22 fits over and is fixed to this nipple so that air under pressure can be delivered to the interior of the air chamber.

Extending rotatably through a hole in the side wall 30 of the air chamber and threaded in the wall 28 is a screw 58. Adjustment of this screw varies the width of the air gap 40 as will presently be described.

It will be recalled that the right-hand squeegee body 16 in the drawing is identical to the left-hand body, just described. Moreover, the right-hand squeegee body is pivotally mounted on the supporting structure 12 in identically the same way as the left-hand squeegee body. It is evident, therefore, that the two squeegee bodies can pivot or swing toward and away from one another. It is also evident from an inspection of FIG. 4 that this pivotal movement of the bodies varies the spacing between the air gaps 40 of the two bodies.

The two squeegee bodies 16 are constantly urged toward one another by the spring 18. As shown best in FIG. 2, the ends of this spring are hooked over projections 60 on the two bodies so as to urge the latter together as just mentioned. Mounted on the supporting structure or plate 12, by the pin and slot means 62 illustrated in FIG. 2, is an adjustable stop 64. As shown best in FIG. 3, this stop has a finger 66 which engages between the downwardly diverging, opposing edges 68 of the supporting legs 48 of the air squeegee. It is evident that when the stop 64 is moved upwardly, as the air squeegee is viewed in the drawing, the stop finger 66 is forced between the leg edges 68 and thereby forces the squeegee bodies 16 apart to increase the spacing between the air gaps 40. In this way, the spacing can be adjusted to accommodate any web thickness. The stop 64 can be locked in position by means of the clamp screw which forms the pin of the pin and slot connection 62.

In operation, the web W to be cleaned is fed upwardly between the squeegee bodies 16 by a transport mechanism, not shown. During this upward travel of the web, air under pressure is delivered to the interiors of the air chambers 24 through the hoses 22. The air is discharged through the air gaps 40 as high velocity jets or streams. It has been found that the obliquity of the air gap 40 with respect to the adjacent terminal portion 42 of each squeegee body creates a condition at the outer end of the passage which turns the air stream issuing from the gap toward the squeegee body and tends to cause the stream to follow around the lower end of the body. In other words, the air stream emerging from the air gap 40 of each body flows lengthwise of the web between the latter and the adjacent squeegee body. This creates a venturi effect between the body and web which holds the latter in close proximity to the body. The web is held out of actual contact with the body by the air cushion between these parts.

As the web W feeds up between the squeegee bodies 16, the moisture, dust, or other contaminants on the surfaces of the web encounter air streams of ever increasing velocity which reach a maximum opposite the air gaps 40. The surfaces of the web are thereby quickly cleaned of these contaminants so that the web emerging from the air squeegee is perfectly clean.

When cleaning motion picture film, of course, it is essential to avoid contact of the film with the squeegee bodies 16 in order to prevent marring of the film. Such contact is avoided, as just explained, by the air cushion which is created between the web and each squeegee body. Preferably, of course, the web is centered between the bodies which requires balancing of the air streams from the air gaps 40.

This balancing of the air streams can be accomplished by adjustment of the air gaps. As mentioned earlier, adjustment of the air gaps 40 is accomplished by the screws 58. Thus, when screw 58 in the right-hand air chamber 24 is rotated in the clockwise direction, the end wall 30 is bent or deflected toward the opposite side wall 28 and its terminal portion 38 approaches the opposing edge face 36 of the sheet metal strip 26 to decrease the width of the air gap 40, as indicated in phantom lines in FIG. 5. Similarly, rotation of the screw 58 in the opposite direction releases the holding force on the side wall 30 which then springs outwardly to increase the width of the air gap 40, also as shown in phantom lines in FIG. 5. Thus, by fine adjustment of the air gap widths, the web W or film to be cleaned can be balanced between, and thereby maintained out of contact with, the squeegee bodies.

One highly important advantage of the present squeegee is that the latter can be quickly and easily disassembled for cleaning, by removing the screws 44 to release the air chamber 24 for removal from between the end plates 42, without disturbing the adjustment of its air gap 40. The advantage of not having to reset the air gap after each cleaning is obvious.

As explained earlier, while the invention has been described as an "air" squeegee, it can, as well, be used to direct streams of cleaning liquid against a web.

Clearly, therefore, the invention herein described and illustrated is fully capable of attaining the objects and advantages preliminarily set forth.

While a presently preferred embodiment of the invention has been described and illustrated, numerous modifications in the design, arrangement of parts, and instrumentalities of the invention are clearly possible within the spirit and scope of the appended claims.

What is claimed is:

1. In a squeegee, a pair of squeegee bodies each comprising a chamber and end plates secured to the ends of

said chamber and extending beyond the chamber to form a pair of aligned supporting legs having aligned bores, a supporting structure, parallel, aligned shafts on said structure passing through the aligned bores of said legs, respectively, to support the latter for pivotal movement toward and away from one another, said chambers having gaps in their opposing sides, the spacing between which is varied by said pivotal movement of the bodies, a spring connected to said bodies for urging the latter together, the opposing edges of said legs of the two squeegee bodies diverging in the direction of the pivotal ends of the legs, a stop on said supporting structure having a finger engaging between said opposing edges, whereby said gap spacing is adjustable by movement of said finger along said edges, and means to fix said stop in its adjusted position.

2. A squeegee comprising a pair of tubulated metal strips each forming a chamber open at its ends, a pair of plates seating against and closing the ends of each chamber, bolts extending through each chamber and its respective end plates for joining the respective chambers and end plates, a fluid inlet to each chamber, one end of each pair of end plates extending beyond the respective chamber to form aligned supporting legs having coaxial bores, a supporting structure including a pair of parallel supporting shafts extending through the bores in said pairs of supporting legs, respectively, and supporting said chambers for pivotal movement toward and away from one another, means for urging said chambers toward one another, stop means for limiting pivoting of said chambers toward one another to positions wherein said chambers are slightly spaced, and the ends of each tubulated metal strip being proximately disposed to form a gap extending endwise of the respective chamber and opening to the space between the chambers.

3. A squeegee comprising a pair of squeegee bodies each including a tubulated metal strip forming a chamber open at its ends, a pair of plates seating against and closing the ends of each chamber, bolts extending through each chamber and its respective end plates for joining the respective chambers and end plates, a fluid inlet to each chamber, one end of each pair of end plates extending beyond the respective chamber to form aligned supporting legs having coaxial bores, a supporting structure including a pair of parallel supporting shafts extending through the bores in said pairs of supporting legs, respectively, and supporting said chambers for pivotal movement toward and away from one another, means for urging said chambers toward one another, stop means for limiting pivoting of said chambers toward one another

to positions wherein said chambers are slightly spaced, one end of each tubulated strip having an edge face extending endwise of the respective chamber and disposed at an acute angle to the adjacent inner surface of the respective strip and the other end of each strip overlapping said edge face of the respective strip, whereby to define a gap between said ends of each strip, the gaps of said chambers opening obliquely to the space between the chambers, and a screw extending between said other end of each strip and another side of the respective chamber for adjusting the width of the respective gap.

4. A squeegee comprising a pair of tubulated metal strips each forming a chamber open at its ends, a pair of plates seating against and closing the open ends of each chamber, bolts extending through each chamber and its respective end plates for joining the respective chambers and end plates, a fluid inlet to each chamber, one end of each pair of end plates extending beyond the respective chamber to form aligned supporting legs having coaxial bores, a supporting structure having two parallel shafts extending through the bores in said pairs of supporting legs, respectively, and supporting said chambers for pivotal movement toward and away from one another, means for urging said chambers toward one another, stop means for limiting pivotal movement of said chambers toward one another to given limiting positions, one end portion of one tubulated strip and one end portion of the other tubulated strip being disposed in approximately parallel, slightly spaced, opposing relationship when said chambers occupy said limiting positions and defining therebetween a narrow space in a plane parallel to and passing midway between said shafts through which a strip to be cleaned is adapted to move, said end portions of said strips each having an edge face extending endwise of the respective chambers and disposed at an acute angle to the adjacent inner surface of the respective strip and the other end of each tubulated strip overlapping said edge face of its respective strip to define a gap oblique to said plane and opening to said space, and a screw extending between said other end of each strip and another side of the respective chamber for adjusting the width of the gap on the respective chamber.

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