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(54) **Toe, forepart & ball laster.**

(57) A machine (101) to last the toe region or forward end of a footwear upper assembly (64) comprising a last (66), an upper (70) draped about the last and an insole (60) including a mechanism (30) to apply an adhesive onto the footwear upper assembly (64) at the forward end of the assembly near the edge of the insole (68), the assembly having an outstanding margin (72), and a mechanism (12) to wipe the outstanding margin (72) onto the insole (68) at the toe region of the assembly, consisting of a wiper pair (12A, 12B) pivotally connected (51) at the toe region, a wiper driver (50) connected to pivot the wiper pair (12A, 12B) at the toe region from a location spaced away from the footwear upper assembly (64) toward an onto the insole (60) at the toe region, and a pair of respective extensions (12A', 12B') of the wiper pair, each extension including an inflatable polyurethane pad (52A, 52B) that serves to engage and wipe the margin (60) in the ball region of the footwear upper assembly (64) onto the insole (68), the extensions (12A', 12B') being slidably attached to the wiper pair (12A, 12B) to permit positional adjustment of each extension (12A', 12B') relative to its associated wiper (12A, 12B) to accommodate differing shoe sizes each pad (52A, 52B) being connected (56A, 56B) to receive fluid gas pressure to inflate the pad after initial wiping has been achieved to effect

wiping of the ball region of the footwear upper assembly (64).

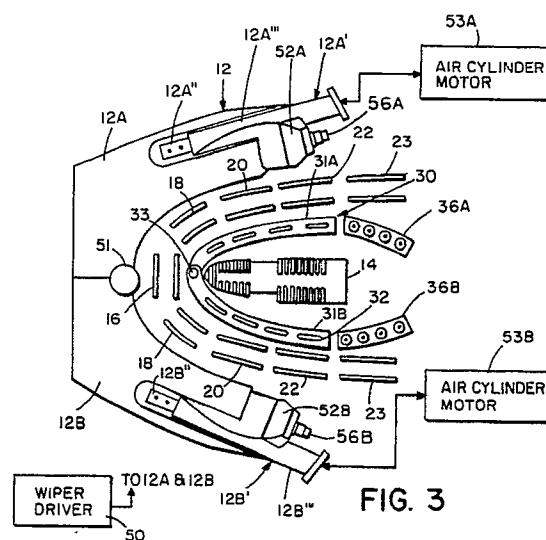


FIG. 3

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TOE, FOREPART AND BALL LASTER

BACKGROUND OF THE INVENTION

The present invention relates to machines adapted to last the toe region or forward end of a footwear upper assembly and, more generally, to last the toe, forepart and ball regions of such assembly.

Attention is called to bulletins of International Shoe Corporation (ISMC) entitled "Pullers and Lasters" and "Combination Toe Thermolasters", as well as United States Letters Patent 3 292 191 (Kamborian); 3 320 626 (Kamborian et al); 3 436 779 (Leonhardt); 3 433 474 (Kamborian et al); 3 444 571 (Harriman et al); Re28 825 (Kamborian et al); 3 675 260 (Kamborian et al); 4 400 839 (Hartshorn et al); 4 553 281 (Vornberger); 4 391 012 (Becka); 4 517 697 (Vornberger); 4 530 124 (Sommer); 4 679 269 (Becka et al); 4 470 165 (Becka); 4 829 932 (Bennett). See, also German Patentschrift DG334118C1 (Sommer). While the present invention applies to footwear more generally, it is discussed hereinafter mostly with reference to shoes.

The foregoing and other patents of ISMC disclose apparatus that is operable to apply adhesive as a ribbon (or as a spray) upon the outer surface of an insole of a footwear upper assembly. That adhesive is preferably applied onto the insole but may be applied onto an outstanding margin, or both. In either case, the margin is later wiped. As used herein the term "in the region between the insole and the margin" (and like terms) describes either situation, or both. Further, as this discussion unfolds, it will be clear that the present invention resides in a novel mechanism to wipe the ball region of the footwear upper assembly.

As is noted in the art cited above, there have been recent developments in computer control of shoe machines with respect to adhesive applicators and other structures. The present invention, however, is concerned with the wiping of a margin onto an insole, and, more precisely, with wiping of the margin in the region at the ball region. This is particularly important in women's shoes which often have drastic changes in contour at the ball region. In what follows reference to "shoe" embraces footwear generally.

OBJECTIVES OF THE INVENTION

Accordingly, it is a principal objective of the present invention to provide a machine that is peculiarly well structured to wipe the toe, forepart and the ball regions of a shoe.

A wiping step in the lasting process, as is very basic in this industry, includes drawing or stretching an upper about and onto the last of the footwear upper assembly. Hence any scheme that is concerned with wiping must include mechanical wiping structures that can withstand the frictional forces encountered in the wiping and drawing process through thousands of wiping operations. A still further objective of the present invention, then, is to provide an inflatable wiping pad that is capable of effecting the necessary wiping of the ball region of the margin onto the insole at the ball region thereof and, despite the friction forces encountered in drawing the upper over and about the last, can withstand the thousands of operations.

Another objective is to provide a lasting machine that can press all parts at the ball region of the margin of a footwear upper assembly to eliminate adhesion gaps and provide uniform bonding throughout the ball region despite rapid contour changes as are encountered with women's shoes, differing shoe sizes, differing shoe styles and left/right shoes.

Further objectives will be evident on the basis of what follows.

SUMMARY OF THE INVENTION

The foregoing objectives are achieved in a machine to last the toe region (or the forward end) of a footwear upper assembly which includes a last, an upper draped about the last and insole at the last bottom. A mechanism is provided to apply an adhesive at the toe region (or forward end) of the assembly near the edge or periphery of the insole, which assembly has an outstanding margin. A wiper mechanism in the machine serves to wipe the outstanding margin onto the insole at the forward end or the region of the insole. The wiper mechanism typically includes two wipers -- a wiper pair -- that typically pivot at the toe region from a location spaced away from the footwear upper assembly to a position wherein wiping is effected of the outstanding margin onto the insole thereof. The wiper mechanism further includes two extensions -- one associated with each of the two wipers of the wiper pair -- that serve to wipe the ball region of the upper assembly. Each extension has at its free end a polyurethane, rubber or other resinous plastic material pad which encounters the footwear upper and performs the actual wiping at the ball region rearwardly thereof. Each of the pads is programmably inflatable to achieve, when fully inflated, the final wiping at the ball region to achieve

uniform and continuous bonding at the ball region despite rapid changes in contour at that region because of style, size, and so forth.

BRIEF DESCRIPTION OF THE DRAWING

The invention is hereinafter described with reference to the accompanying drawing in which:

Fig. 1 is an isometric view of a portion of a shoe lasting machine that includes wiping mechanisms, shown only generally in the figure, according to the present invention for wiping the toe, forepart and ball regions of a shoe or other footwear upper assembly;

Fig. 2 is a plan view, mostly diagrammatic in form, of parts of the machine in Fig. 1;

Fig. 3 is a view, partly diagrammatic in form, taken on the line 3-3 in Fig. 2, looking in the direction of the arrows and showing a main wiper pair, each wiper of the main wiper pair having an extension that serves to wipe the ball region of the shoe upper assembly, each extension including an inflatable pad that serves to wipe the ball region of the assembly;

Fig. 4 is a sectional partial view showing, inter alia, one such inflatable pad; and

Fig. 5 is an isometric view from the left rearward perspective of a shoe upper assembly that has been wiped by a pair of inflatable pads.

DETAILED DESCRIPTION OF THE INVENTION

Turning now Fig. 1 there is shown at 101 a portion of a footwear forming machine that embodies the present inventive concepts shown in detail in later figures. The operator is intended to stand facing the machine 101 looking inwardly (i.e., in the plus Y-direction) from the bottom of Fig. 1. Machine parts closest to the operator are considered to be at the front of the machine and machine parts farthest from the operator are considered to be at the back of the machine. Parts moving toward the operator (i.e., in the minus Y-direction) are considered to have forward movement and parts moving away from the operator are considered to have rearward movement.

The machine 101 receives a shoe upper assembly 64 partially shown in broken-line form in Fig. 2 and in Fig. 5, consisting of a last 66, an inner sole (or insole) 68 tacked or otherwise secured to the last, and a shoe upper 70 draped about the toe, forepart and ball areas or regions of the last 66. The assembly 64 is presented, bottom down, with the inner sole 68 bearing against the top of an inner sole support or insole rest 14 (see Fig. 3). The toe end extremity of the last bears against a

toe bar (not shown) and the margin 72 of the upper 70 extends between the jaws of pincers 16, 18, 20, 22 and 23 in Fig. 3 which serve, in conjunction with other active elements of the machine 101, to stretch and form the upper 70 about the last 66. A hot adhesive is applied by an adhesive applicator mechanism 30 (Fig. 3) to the bottom of the inner sole 68 near the edge (or periphery thereof) at the toe portion of the shoe upper assembly, typically at the toe, the forepart and the ball area of the inner of sole edge, against which the margin will later be wiped and adhered thereto, that is, in the region between the insole 68 and the margin 72.

The applicator mechanism 30, as shown in Fig. 3, includes two extruder sections 31A and 31B having ports 32 through which hot adhesive flows when the mechanism 30 is pressed against the insole bottom. The two extruder sections 31A and 31B are pivotally adjustable about a pivot point 33 between positions wherein the free ends thereof are positioned closer to one another to accommodate larger shoe sizes (see Vornberger patent 4 517 697), to permit application of the adhesive close to the edge of the inner sole. As explained below, the upper margin 72 is thereafter wiped (by wipers 12 in Fig. 3) against the inner sole. It is the wiping step of lasting toward which this invention is directed, as taken up below, and, in particular, the wiping of the upper margin firmly, uniformly and continuously against and unto the insole throughout the ball region of the upper assembly.

The adhesive applicator mechanism 30 includes two extruder extensions 36A and 36B in Fig. 3 pivotally connected (e.g., by a hollow pivot) at the free ends of 31A and 31B, respectively, to form thereby two articulated extruders. The pivot ends of the extension 36A and 36B move with the extruder sections 31A and 31B to which they are pivotally attached, but the free ends thereof are independently adjustable, as is discussed in the 4 517 697 patent in great detail. Extruder ports 32 permit flow of adhesive onto the inner sole. The particular way by which the adhesive is delivered to the insole is not critical to the present invention. For example, the nozzle mechanisms shown in other patents noted above may be used. The issue here is wiping, as now explained.

The main wiper mechanism 12 noted above (this is a preferred wiper configuration) is operable to wipe the outstanding margin 72 onto the insole 68 at the toe, forepart and regions of the assembly 64. The wiper 12 includes a wiper pair 12A and 12B, in the preferred embodiment, pivotally connected at the toe region, a wiper driver 50 connected to pivot the first wiper pair at the toe region pivot 51 from a location spaced away from the footwear upper assembly toward and onto the insole at the toe region and respective extensions

12A' and 12B' of the wiper pair, each wiper of each extension including at its free end an inflatable resinous pad 52A and 52B, respectively, that serves to engage and wipe the margin in the ball region of a footwear upper assembly 64 onto the insole 68; see Fig. 5. The extensions 12A' and 12B' are slideably attached to the first wiper pair 12A and 12B along T-channels channels in the respective extension, which receive slides 12A'' and 12B'' to permit positional adjustment longitudinally of the shoe upper according to shoe size, left and right shoe, etc., and, once so positionally adjusted, each extension is held in firm mechanical positioning relative to the first wiper pair 12A and 12B. Each of the resinous pads 52A and 52B is an inflatable pad (see cavity 57A in Fig. 4) that is connected to receive fluid (typically air) under pressure (see air fittings 56A and 56B in the figures) to inflate the pad after initial wiping has been achieved by the pad to effect wiping of the shoe assembly 64 in the ball region thereof, that is, to press the margin and the assembly firmly against the last at the ball region; see Fig. 5.

The resinous materials of interest here include polyurethane, rubber or the like which can withstand the frictional forces before referred to during initial wiping and drawing of the upper about the ball region of the last 66 and can withstand, as well, the multiple actuations and inflations in repetitive wiping. The pads 52A and 52B each must withstand the friction forces noted above as well as the multiple inflations clearly required here. In addition, each pad 52A and 52B must, when inflated, conform precisely to the contour of the ball region of the upper assembly 64, i.e., the pads 52A and 52B must be pliable. Said another way the pads 52A and 52B, when fully inflated, must conform to the actual shape of the shoe bottom in the ball area thereby to apply a force onto the respective lasting margin to press adhesive fluids disposed between the lasting margin 72 and the insole 68 and assure continuous and uniform bonding of the margin 72 to the insole 68. A metal base 57A in Fig. 4 receives the molded pad 52A and provides mechanical support therefor. The base 57A rests on the wiper 12A which absorbs the wiping forces and transfers them to the frame of the machine 101.

The present teaching tracks earlier work in that the earlier machines employed pads, but these typically were solid, and not inflatable. Further it was and is the practice to move the metal pads toward the toe-end of the shoe after preliminary wiping, as is done here. Similarly, here, air cylinders 53A and 53B (which may be double-acting air cylinders) serve as pad drivers to drive the respective pad in a toe-ward direction once the wiper pair has effected wiping, thereby to achieve some further wiping or pressing of the margin onto

the insole. The blocks 53A and 53B each includes an air cylinder but also includes a servomotor or the like to adjust for shoe length -- a structure used for several years in this art. These are known structures in this art. According to the present teaching, in the course of wiping, the pads 52A and 52B are inflated to remove wrinkles from the ball region of the margin and provide uniform wiping of the ball region, that is, both sides of the upper assembly 64 are uniformly wiped in the ball region thereof. The label 73 in Fig. 1 designates a heel clamp common in this industry to determine left or right shoe assembly.

The foregoing specification has emphasized the preferred embodiment of the invention wherein the main wipers are activated by pivoting action and the inflatable pads are also pivoted and then moved translationally; but there are other shoe lasting machines that employ translational movement of the main wipers (which may be multiple wiping units in an articulated configuration) and pivot at -- or other -- movements of any extensions thereof. The present invention, as emphasized above and noted here, is the inflatable pad aspect. The pads 52A and 52B according to the present teaching are programmably inflated to be so inflated during the wiping operation.

Typically, the main wipers 12A and 12B (in the preferred embodiment) are pivotally moved to achieve wiping; the extensions 12A' and 12B' move therewith. At some point during closure of the main wipers 12A and 12B, the inflatable pads 52A and 52B are programmably begun to be sequentially inflated, full inflation occurring, typically, when the main wipers 12A and 12B have completed their wipe and when the extensions 12A' and 12B' have been moved toe-ward to press respective pads 52A and 52B onto the ball region on the respective insole. It should be noted here that in the lasting and pressing operation of the pads 52A and 52B, the metal part 59A (and the further metal parts of the pad structure, not shown) rest on the top surface of the respective wiper 12A (and 12B) which provides mechanical support therefor during the ball wiping, as previously indicated. A nylon mesh or the like may be used in the pads 52A and 52B to enhance strength for multiple activations.

Preferably the invention provides a machine to last the toe region or forward end of a footwear upper assembly, which footwear upper assembly includes a last, an upper draped about the last and an insole at the last bottom, which machine comprises:

means to apply an adhesive onto the footwear upper assembly at the toe region or forward end of the assembly near the edge (or periphery) of the insole, said assembly having an outstanding mar-

gin: and

wiper means operable to wipe the outstanding margin onto the insole at the toe region of the assembly, said means including wipers and extensions thereof positioned and connected at said toe region, a wiper driver connected to pivot the wiper pair at said toe region from a location spaced away from the footwear upper assembly toward and onto the insole at the toe region, and a pair of respective extensions of the wiper pair, each extension including a resinous pad that serves to engage and wipe the margin in the ball region of the footwear upper assembly onto the insole, said extensions being movably attached to the respective wiper of the wiper pair to permit positional adjustment of each extension relative to its associated wiper to effect wiping and to accommodate differing footwear sizes and left and right footwear and, once so positionally adjusted, being held in firm positioning relative to the respective wiper of the wiper pair, each said resinous pad being an inflatable pad that is connected to receive fluid under pressure programmably to inflate the pad after initial wiping has been commenced by the pad to effect further wiping of the ball region of the footwear upper assembly, inflation of the pad at that juncture in the course of wiping serving to conform the pad wiping surface to the actual shape of the

Claims

1. A machine (101) to last the toe, forepart and ball regions, of a footwear upper assembly (64), which footwear upper assembly (64), includes a last (66), an upper (70) draped about the last (66) and an insole (68) at the last bottom, which machine comprises:

means (30) to apply an adhesive onto the footwear upper assembly (64) at the toe region or forward end of the assembly near the edge of the insole (68), said assembly having an outstanding margin (72); and

wiper means (12) operable to wipe the outstanding margin (72) onto the insole (68) at the toe region of the assembly, said wiper means (12) including a wiper pair (12A, 12B) pivotally connected (51) at said toe region, a wiper driver (50) connected to pivot the wiper pair (12A, 12B) at said toe region from a location spaced away from the footwear upper assembly (64) toward and onto the insole (68) at the toe region with the margin (72) therebetween; characterised in that said wiper pair (12A, 12B) includes a pair of respective extensions (12A', 12B'), each said extension (12A', 12B') including a resinous pad (52A, 52B) that serves to engage and wipe the margin (72) in the ball region of the footwear upper assembly (64) onto the insole (68),

said extensions (12A', 12B') being slidably attached to the respective wipers (12A, 12B) of the wiper pair to permit positional adjustment of each extension (12A', 12B') relative to its associated wiper to accommodate differing footwear sizes and left and right footwear and, once so positionally adjusted, being held in firm mechanical positioning relative to the respective wiper of the wiper pair (12A, 12B), each said resinous pad (52A, 52B) being an inflatable pad (57A) that is connected to receive fluid under pressure to inflate the pad after initial wiping has been achieved by the pad (52A, 52B) to effect further wiping of the ball region of the footwear upper assembly (64), inflation of the pad (52A, 52B) at that juncture in the course of wiping serving to conform the pad wiping surface to the actual shape of the footwear bottom in the ball region and thus apply pressure on the lasting margin to evenly distribute the deposited adhesive and assure continuous bonding of the margin (72) to the insole (68) at the said ball region.

2. A machine according to claim 1 in which each pad (52A, 52B) is formed of polyurethane rubber.

3. A machine according to claim 2 in which the wiper means (12) includes a mechanical structure to move the respective wipers of the wiper pair (12A, 12B) from a position removed from the footwear upper assembly (64) to a position at which wiping of the margin (72) onto the insole (68) is effected.

4. A machine according to claim 1, 2 or 3 that includes pad driver means (53A, 53B) that serves to drive each respective pad (52A, 52B) in a toe-ward direction once the wiper pair (12A, 12B) has effected wiping and in which the pads (52A, 52B) are then fully inflated to complete the final wiping of the ball region.

5. A machine according to claim 3 that includes a source of air under pressure connected (56A, 56B) to inflate the inflatable pads (52A, 52B).

6. A method of lasting the toe region for forward end of a footwear upper assembly, which footwear upper assembly includes a last, an upper draped about the last and an insole at the last bottom, which method comprises the steps of applying an adhesive onto the footwear upper assembly at the toe region or forward end of the assembly near the edge or periphery of the insole, said assembly having an outstanding margin; and

wiping the outstanding margin onto the insole at the toe region of the assembly; characterised in that said wiping includes activating a wiper pair movably connected at said toe region, moving the wiper pair at said toe region from a location spaced from the footwear upper assembly toward and onto the insole at the toe regions and activating respective extensions of the wiper pair, each extension including a resinous pad that serves to wipe the

margin in the ball region of the footwear upper assembly onto the insole, said extension being movably attached to the respective wiper of the wiper pair to permit positional adjustment thereof and, once so positionally adjusted, held in firm mechanical connection to respective wiper of the wiper pair, each said resinous pad being an inflatable pad that is connected to receive fluid under pressure to inflate the pad after initial wiping has been achieved by the associated wiper of the wiper pair to effect wiping of the ball region of the footwear upper assembly. 5 10

7. A method according to claim 6 in which said positional adjustment is generally along the longitudinal axis, i.e., the toe to heel axis, of the footwear upper assembly. 15

8. A machine (101) to last the toe, forepart and ball regions of a footwear upper assembly (64) that includes a last (66), an upper (70) draped about the last (66) and an insole (68) at the last bottom, which machine includes means (30) to apply an adhesive onto the footwear upper (64) assembly at the toe, forepart and ball regions in the region between the margin and the insole, and wiper means (12), characterised in that said wiper means (12) includes inflatable pad means (52A, 52B) positioned and connected to wipe the ball region of the upper margin (72) onto the insole (68). 20 25

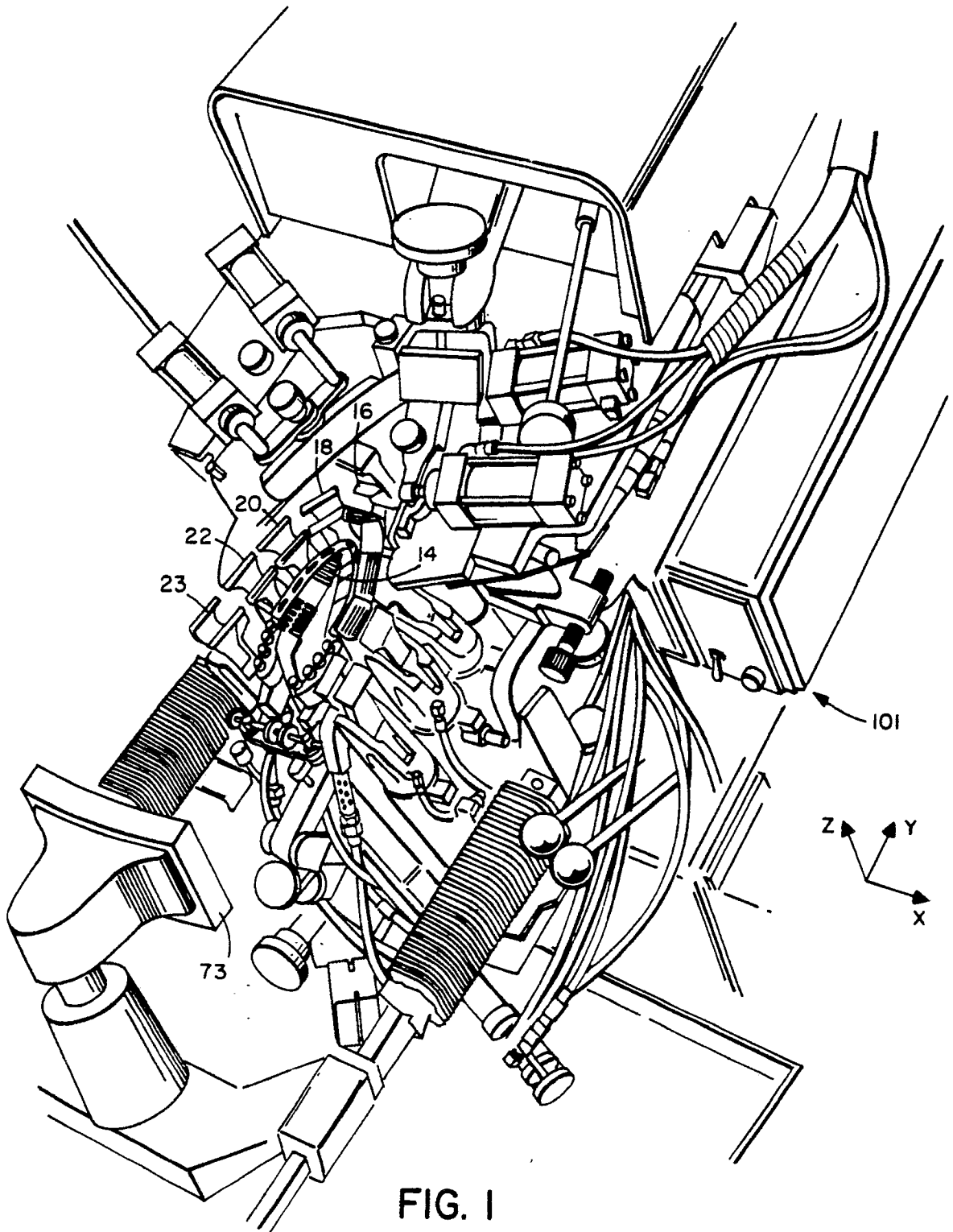
9. A machine according to claim 8 in which the wiper means (12) includes a pair of inflatable polyurethane pads (52A, 52B) and a source of fluid under pressure connected (56A, 56B) to inflate the pads (52A, 52B) at a controllable rate in a determined sequence. 30

10. The machine of claim 9 wherein said source is programmably controlled to inflate the pair of inflatable pads (52A, 52B) after the main wipers (12A, 12B) have initiated wiping and to fully inflate the inflatable pads after the main wipers have completed their wiping. 35 40

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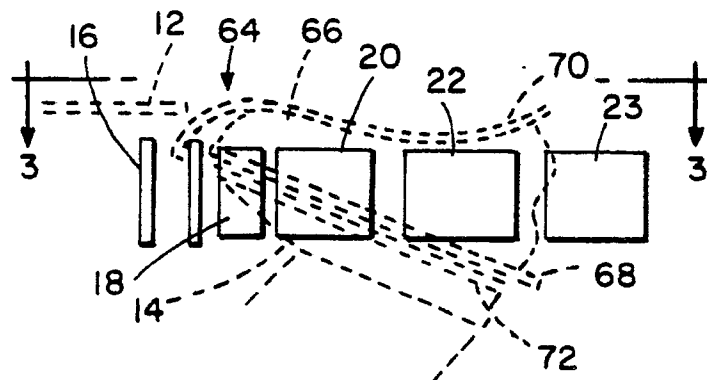
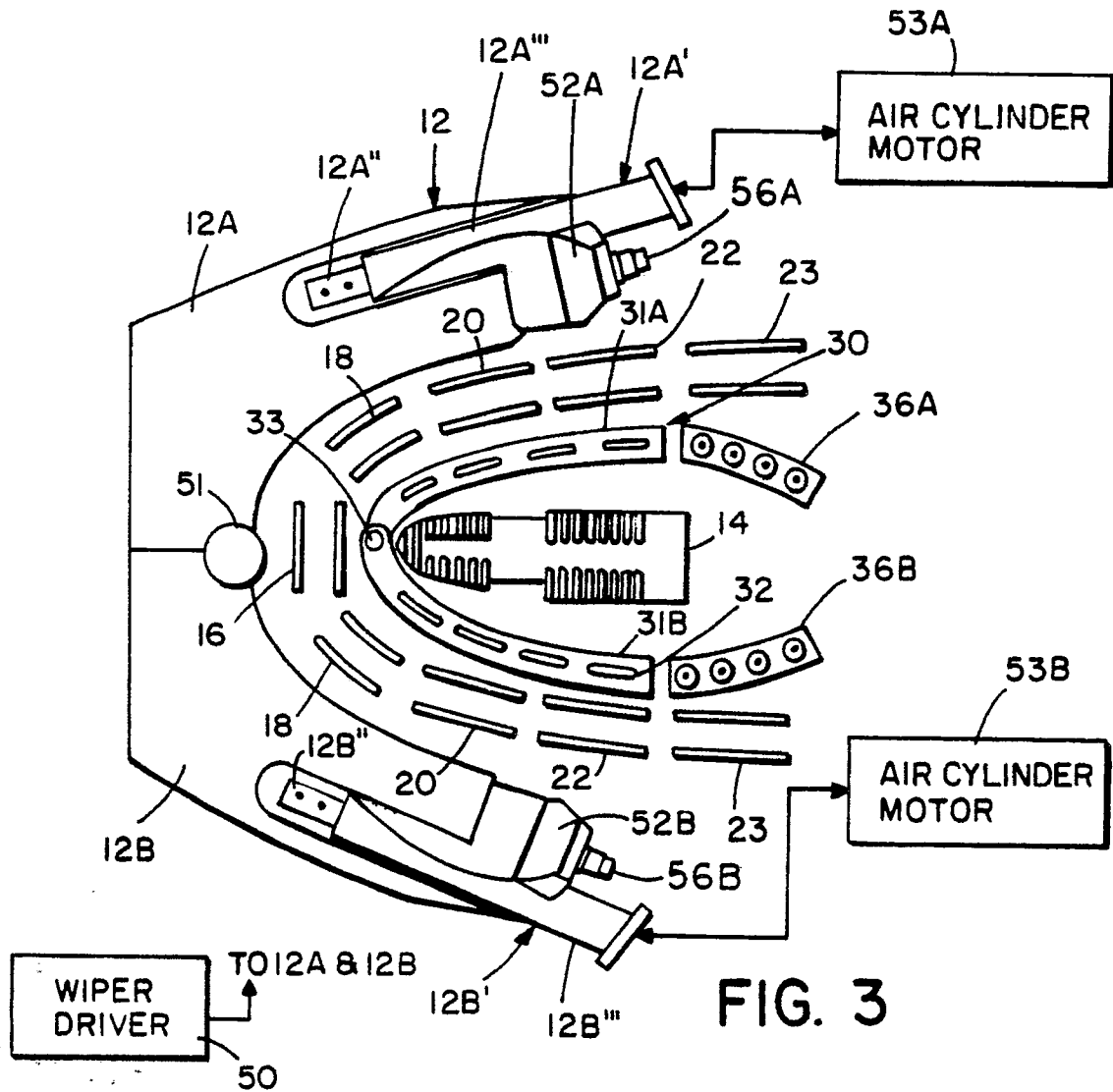


FIG. 2

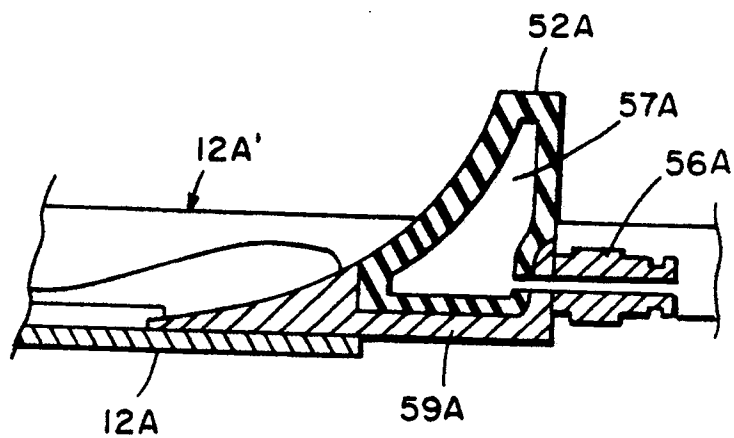


FIG. 4

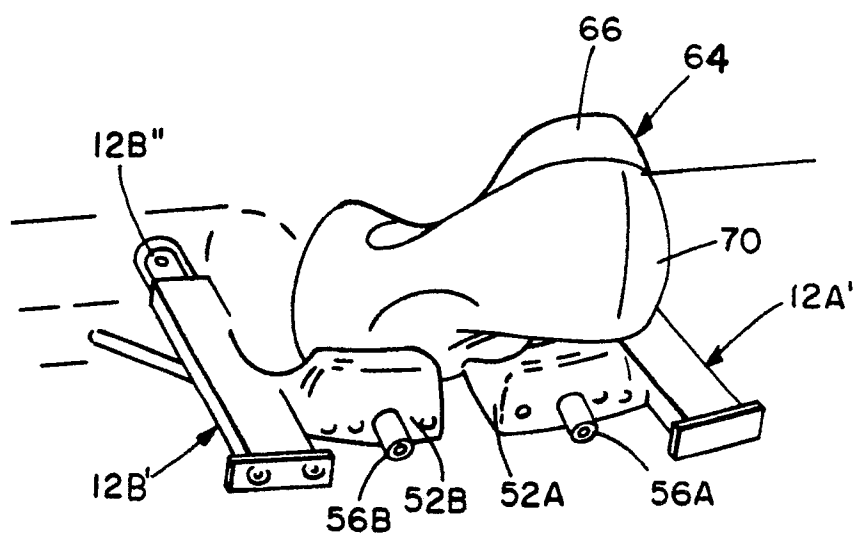


FIG. 5