

[54] **DEVICE FOR REMOVING THE UPPER  
PIECE FROM A CUT LAY**  
[76] Inventor: **George Carroll**, 12 Palmerston Rd.,  
Woodsmoor, Stockport in the  
County of Cheti, England  
[22] Filed: **June 12, 1973**  
[21] Appl. No.: **369,358**

[30] **Foreign Application Priority Data**  
June 14, 1972 United Kingdom..... 27755/72  
[52] **U.S. Cl.**..... 271/18; 271/97; 294/64 B;  
294/86 R  
[51] **Int. Cl.**..... B65h 3/00; B65h 3/14  
[58] **Field of Search**..... 271/11, 14, 97, 98, 105,  
271/19, 20, 18; 294/64 B, 86 R

[56] **References Cited**  
**UNITED STATES PATENTS**  
3,158,367 11/1964 Tarbuck..... 271/11 X  
3,168,307 2/1965 Walton et al. .... 271/97

3,194,551 7/1965 Herr et al. .... 271/14  
3,253,824 5/1966 Southwell et al. .... 271/19  
3,588,091 6/1971 Stone et al. .... 171/19  
3,738,645 6/1973 Gray et al. .... 271/97

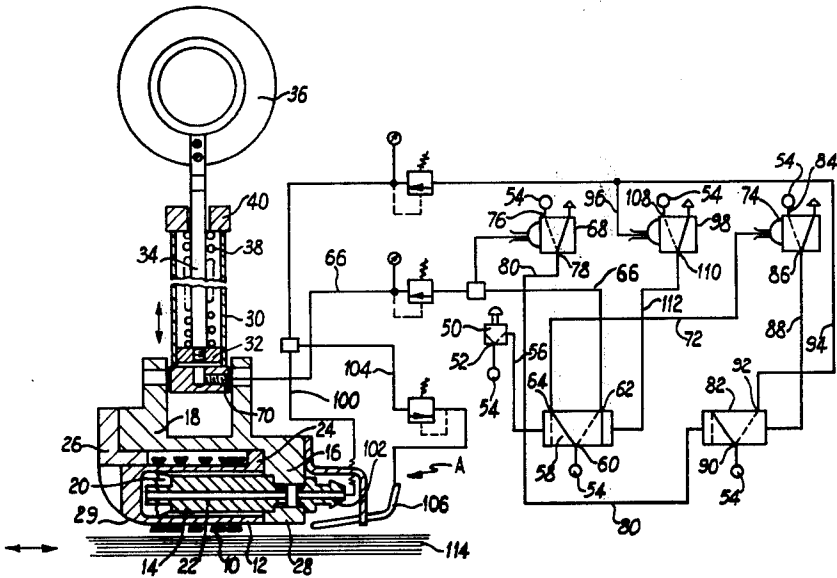
**OTHER PUBLICATIONS**

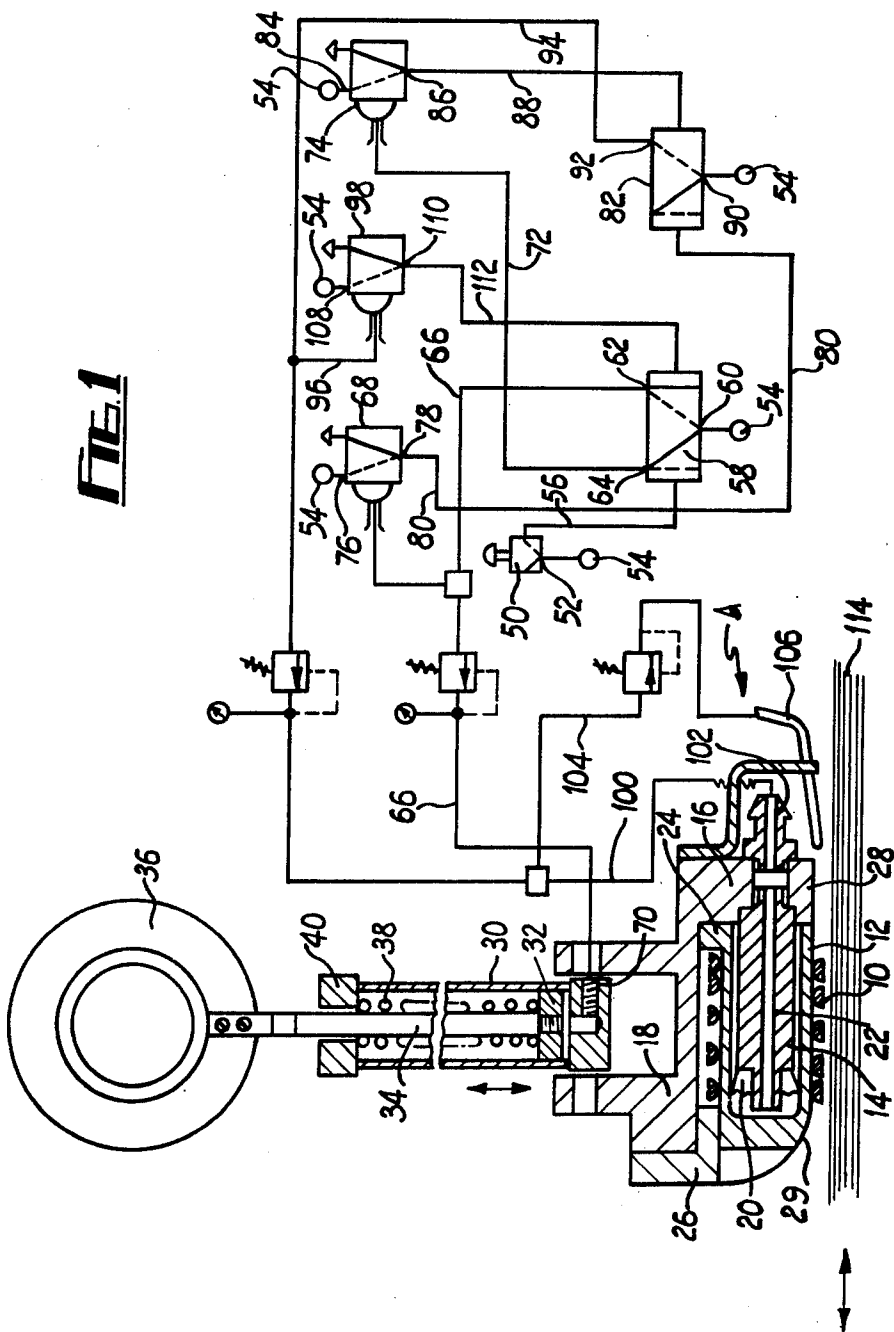
Aycock, T. L. and Hetherington, J. C. "Feed Mechanism for Printed Circuit Boards." Western Electric Technical Digest No. 26. April, 1972, pp. 3 & 4.

*Primary Examiner*—Evon C. Blunk  
*Assistant Examiner*—Bruce H. Stoner, Jr.  
*Attorney, Agent, or Firm*—Browne, Beveridge,  
Degrandi & Kline

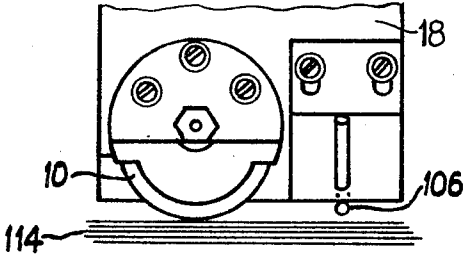
[57] **ABSTRACT**  
A device for removing one piece from a cut lay comprising, a plate, which is at least in part substantially horizontal, means for directing a stream of air under said plate and means for producing relative movement of said plate and the cut lay towards and away from each other.

**7 Claims, 5 Drawing Figures**

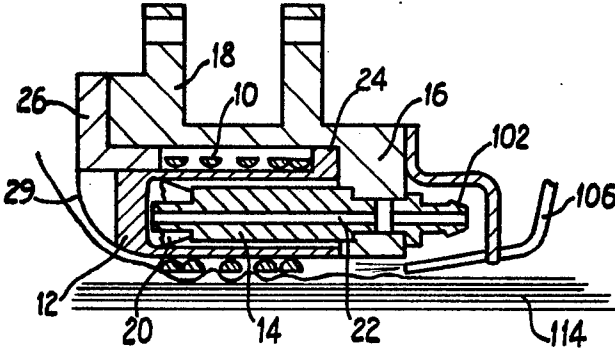




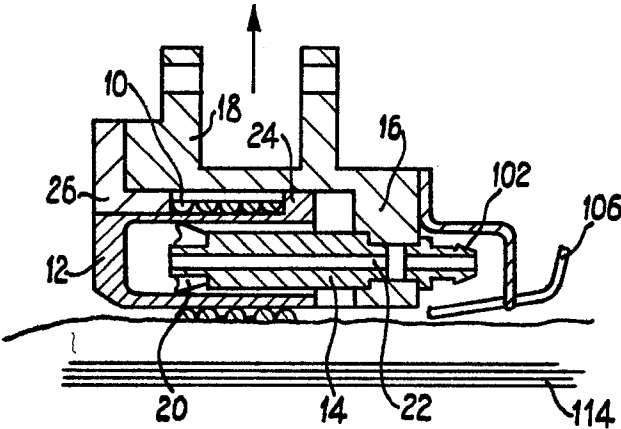
SHEET 2 OF 2



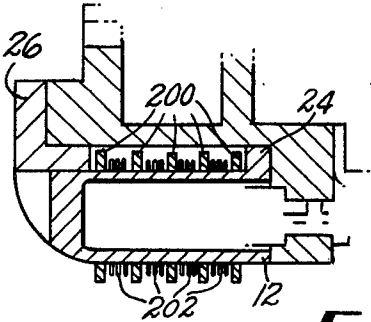
**FIG. 2**



**FIG. 3**



**FIG. 4**



**FIG. 5**

## DEVICE FOR REMOVING THE UPPER PIECE FROM A CUT LAY

This invention relates to a device for removing one piece from a cut lay.

In this specification a cut "lay" is intended to mean a pile of fabric assembled by unrolling fabric on a surface, such as a cutting table while traversing backwards and forwards to build-up a pile in which adjacent layers are either face-to-face or reverse-to-reverse. The pile or stack so formed is called a "lay" and a cut lay is produced from the lay normally by placing one or more patterns thereon and cutting out accordingly through the entire thickness of the lay.

In the manufacture of clothing, a machinist supplied with one or more cut lays must separate one piece, generally the upper piece, therefrom before each machining operation. Quite apart from the fact that alternate pieces in the cut lay are, so to speak, upside down, the manual separation of the upper piece and only the upper piece requires a fair degree of dexterity and even when such dexterity is acquired by a machinist, the separation aforesaid is still relatively time consuming. It has been estimated that in the machining of pieces from a cut lay, the sewing machine may be idle for as much as 60% of the machinist's working time.

The present invention has been made in an attempt to deal with this problem.

Amongst many proposals the applicants investigated the use of suction but this principle was found not to be applicable to fabrics which are porous, their porosity varying in accordance with the nature of the fabric. Because of the porosity aforesaid a conventional rubber suction cap had no effect whatsoever on the fabric since the reductions in pressure under the cap only took place on the individual strands of fabric beneath the cap, and these strands have a relatively small surface area. When the suction cap was increased in size so as to apply suction to a sufficiently large area of the fabric, the vacuum necessary to produce any effect was expensive to produce and the provision of large diameter piping made the device extremely cumbersome. Further because of the porosity of fabric, even when the upper piece could be lifted by suction from the lay the second and frequently subsequent pieces were lifted simultaneously.

The applicants also considered the use of adhesive but clothing manufacturers are not keen on employing adhesives since such use may damage the fabric or in some way impair the finish thereof.

According to the present invention there is provided a device for removing one piece from a cut lay comprising, a plate, which is at least in part substantially horizontal, means for directing a stream of air under said plate and means for producing relative movement of said plate and the cut lay towards and away from each other.

Preferably the downstream end of the plate is curved upwardly so that the flow of the air stream thereover creates an aerodynamic lift. The plate is preferably provided with an aperture therein through which the air stream is directed, the downstream edge of the plate being desirably formed as a knife edge.

Instead of being curved upwardly as aforesaid the plate may be provided with downwardly depending walls along, at least, the sides thereof, so that the pas-

sage of the air stream beneath the plate reduces the pressure beneath said plate.

According to one embodiment of the invention the device also comprises gripping means including two or more elements movable towards and away from, each other in a first direction which first direction, is, in use, substantially parallel to the plane of the pieces of fabric in a cut lay. Preferably means are provided for adjusting the distance between adjacent elements of the gripping means so that only one piece of the cut lay enter between adjacent elements and be gripped by the gripping means.

The gripping means may comprise a plurality of discs which are normally urged away from each other by means of a spring. Alternatively the plurality of discs and spring as aforesaid may be replaced by a coil spring having two or more turns which are normally spaced apart. A body preferably extends through bores in the discs or axially through the coil spring and means are provided for moving the discs or the spring relative to the body so that the discs or the turns of the spring move towards each other for the purpose of gripping a piece, preferably the upper piece, of a cut lay therebetween.

The operation of the gripping means is preferably effected pneumatically although it may of course be operated mechanically, electrically, magnetically or by a combination thereof.

The relative movement of the plate and the cut lay is preferably effected by means such as a piston and cylinder for reciprocatably moving the plate towards and away from a cut lay located on a surface which is preferably horizontal, such as a table top. Alternatively the cut lay may be placed on a surface which is itself movable towards and away from the plate. The means for moving the plate relative to a cut lay is preferably operated by the same principle as used for operation of the gripping means in those embodiments where a gripping means is provided.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:

FIG. 1 shows one embodiment of a device according to the invention, partly in section together with a pneumatic circuit for operating the device;

FIG. 2 shows the gripper body of the device of FIG. 1 as viewed in end elevation in the direction of the arrow A in FIG. 1;

FIG. 3 shows the gripper of FIG. 1 approaching the top of a cut lay with the jet in operation;

FIG. 4 shows the gripper of FIG. 1 retaining a piece of material;

FIG. 5 shows an alternate embodiment of a gripper utilizing discs.

In the drawings, like parts of the various embodiments have been given the same reference numerals.

Referring to FIG. 1 of the drawing a coil spring 10 having a diameter of 0.85 inches and a wire diameter of 0.06 inches is disposed around a horizontal cylinder 12. The outer surfaces of the spring are ground to the form shown in the drawing where the cross-sectioned shape of the wire is substantially hemispherical, the final spring diameter being 0.79 inches.

A piston 14, which is received in the cylinder, is fixed at one end to a downwardly depending arm 16 of a support 18 and is provided with a seal 20 at the other, inner end thereof which makes a seal between the pis-

ton and the cylinder. A bore 22 extends longitudinally through said piston.

An outwardly directed flange 24 is provided at the open end of the cylinder 12 and which extends around the upper part of the outer surface of the cylinder, that is to say the surface adjacent the support 18. A part of one end of the spring 10 bears against the flange 24 and a part of the other end of the spring bears against a stop member 26 fixed to the support 18. By virtue of this arrangement the spring 10 urges the cylinder 12 towards the right (as viewed in FIG. 1) such that normally the flange 24 abuts against the arm 16 and such that adjacent coils of the spring are normally spaced apart.

The undersurface 28 of the arm 16 is substantially flat and is horizontally disposed as can be seen in FIG. 2. The lowermost part of the outer surface of the cylinder 12 is located in the same plane as the said undersurface 28 so that the coils of the spring 10 project downwardly from the device as a whole. The closed end of the cylinder 12 is covered by arcuate plate of metal or plastics 29 which extends through substantially 90° from the horizontal plane containing the undersurface 28 to a vertical plane.

The gripper support 18 is fixed to one end of a vertically disposed third cylinder 30 which receives a piston 32 fixed to one end of a piston rod 34. The other end of the piston rod 34 is fixed to means 36 movable in a direction normal to the plane of the drawing for example a device such as is described in our U.S. Pat. No. 3,158,367.

A spring 38 surrounds the piston rod, and bears against the piston 32 and the end 40 of the cylinder 30 so as to urge cylinder 30, and hence the gripper support 18, upwardly as viewed in the drawing.

The pneumatic logic circuit shown in the drawing for operating the device will now be described.

A manually controlled valve 50 has an inlet port 52 connected to a source of pressure air 54 and an outlet port connected by line 56 to first spool valve 58 for actuation of the valve 58. Spool valve 58 has an inlet port 60 connected to the source 54 and outlet ports 62 and 64. Outlet port 62 is connected by line 66 to a delayed action valve 68 for opening of valve 68 and to inlet port 70 of cylinder 30. Outlet port 64 is connected by line 72 to a second delayed action valve 74 for opening of valve 74.

Valve 68 has an inlet port 76 connected to source 54 and an outlet port 78 connected by line 80 to a second spool valve 82 for opening valve 82. Valve 74 has an inlet port 84 connected to the source 54 and an outlet port 86 connected by line 88 to spool valve 82 for closing said valve 82.

The second spool valve 82 has an inlet port 90 connected to the source and an outlet port 92 to which line 94 is connected. Line 94 has a first branch 96 connected to third delayed action valve 98 for opening said valve 98, a second branch 100 connected to inlet port 102 for the bore 22 in the piston 14 and a third branch 104 leading to an air jet 106 mounted on the support 18 and arranged to direct a substantially horizontal stream of air below the spring 10 and in a direction generally parallel to the longitudinal axis of the cylinder 12. The third delayed action valve 98 has an inlet port 108 connected to the source and an outlet port 110 connected by line 112 to the spool valve 58 for actuation of said valve 58.

The device just described operates as follows:

A cut lay 114 is placed on a suitable horizontal surface and at the start of the operation, the logic circuit is in the condition, where the inlet 60 of the spool valve 58 connects the source 54 to the outlet 64 so that valve 74 is open and inlet port 84 connected to outlet port 86. Pressure air is thus admitted from the source along line 88, to hold spool valve 82 closed. Valves 68 and 98 are closed.

To pick up the upper piece from the cut lay the gripper is moved by means 36 until the spring 10 is located above the cut lay.

The valve 50 is then opened to admit pressure air from source 54 through inlet 52 and outlet 56 of valve 50 and along line 56 to spool valve 58 which is thus actuated to connect inlet 60 to outlet 62. Pressure air is thus no longer delivered through outlet 64 of the spool valve 58 to line 72 so that valve 74 closes the supply of pressure air along line 88 to spool valve 82.

Pressure air from the outlet 62 of the spool valve 58 passes along line 66 to the inlet 70 of cylinder 30. Since the piston 32 is held by its rod 30 onto the means 36 the cylinder will move downwardly as viewed in the drawings against spring 38, carrying therewith the support 18 until the spring 10 engages the cut lay 114. Pressure air in line 66 is simultaneously led to valve 68 whose action is delayed for a time sufficient to allow the downward movement of the cylinder 30 to bring the spring 10 into engagement with the cut lay. At the end of the delay time valve 68 opens so that pressure air flows from source 54 through the inlet 76 and outlet 78 of valve 68 and through line 80 to open spool valve 82 which is no longer held closed due to the closure of valve 74.

The opening of spool valve 82 connects the source 54 through inlet 90 to outlet 92 so the pressure air is admitted to line 94.

Air from line 94 flows through branch 104 so that jet 106 delivers a stream of air across the top of the cut lay. The effect of this stream passing between the top of the cut lay on the one hand and the undersurface 28 of the end lower surface of the cylinder 12 on the other hand is to cause the upper piece in the cut lay to lift at intervals to adopt a rippled configuration as can be seen in FIG. 3.

Further the air stream passing over the curved plate 29 creates an aerodynamic lift which raises the right hand end (as viewed in FIG. 3) of the upper piece of the cut lay. The total effect, therefore, of the air stream from the jet 104 is to separate the upper piece of the cut lay from the remaining pieces therebelow.

At the same time as the upper piece of the cut lay is being separated as aforesaid, air from line 94 flows into branch 100, to the inlet 102 and through the bore 22 thereby moving cylinder 12 towards the right (as viewed in the drawing) against the spring 10. The aforesaid movement to the right of the cylinder 12 compresses spring 10 so that the upper piece of the cut lay is caught and held between two adjacent coils of the said spring 10 as shown also in FIG. 3.

Air is also delivered through branch 96 to the delayed action valve 98. The action of valve 98 is delayed for a period sufficient to ensure that the upper piece of the cut lay has been separated from the remaining pieces and has also been engaged by the spring 10 and at the end of that delay valve 98 is opened. Pressure air from source 54 is thus led through inlet port 108 and

outlet port 110 and through line 112 to actuate spool valve 58 and connect inlet 60 with outlet 64.

Pressure air is no longer delivered through line 66 to cylinder 30 so that spring 38 now raises the cylinder 30 and with it the support 18 which carries spring 10 and the upper piece of the cut lay held thereby. At the end of a delay period sufficient to allow the cylinder to be raised (FIG. 4) and the device to be moved as desired by the means 36, the valve 74 is opened as a result of pressure air delivered from source 54 through inlet 60 and outlet 64 of spool valve 58 and through line 72. Pressure air now flows through line 88 the close spool valve 82 so that the source 54 is disconnected from line 94 and its branches 96, 100 and 104.

Cylinder 12 now moves towards the left due to the action of the spring 10, the turns of the spring 10 move away from each other and the piece of fabric lifted by the spring 10 falls therefrom under gravity and unaffected by jet 106, which, due to the closure of valve 82, is no longer supplied with air.

The above-described sequence of operations is repeated for subsequent pieces of the cut lay.

It will be understood that the above-described specific embodiment is only one example of the device and a logic circuit for control thereof. It would normally be necessary to make some adjustments to the device for various types of fabrics. The downward pressure of the spring 10 on the cut lay can be adjusted by altering the pressure of the air admitted to cylinder 30. Similarly the gripping pressure exerted by the spring 10 on a piece can be varied by adjusting the air pressure admitted to cylinder 12. In order to ensure that the spring will positively grip the upper piece and only the upper piece the pitch thereof of the spring may be adjusted, for example, by varying the distance between the flange 24 of the cylinder 12 and the stop member 26 against which the spring 10 bears. Generally the pitch of the spring is adjusted so that the distance between adjacent coils, when the spring is in the position shown in FIG. 1, is about twice the thickness of a piece of fabric to be picked-up. Similar provision is made where the spring 10 is replaced as shown in FIG. 5 by two or more discs 200 having bores there-through through which the cylinder 12 extends and which are urged apart from each other by, for example a spring or springs 202 of diameter smaller than the discs.

With the device according to the invention and making appropriate adjustments it has been found possible to lift a piece from a cut lay of fabric ranging from

0.003 to 0.125 inches thickness having a texture of from pliable and soft to very stiff and coarse.

What is claimed is:

1. A device for removing one piece from a horizontal cut lay comprising a plate which is at least in part substantially horizontal, gripping means including at least two elements movable toward and away from each other in a direction which is substantially horizontal, means for moving both the plate and gripping means together between a first position wherein the elements of the gripper are immediately adjacent the cut lay and a second position wherein the gripper is spaced from the cut lay, means for directing a stream of air under said plate at least when said plate and gripper are in said first position and means for closing said gripper elements after said stream of air is applied so as to engage one piece of the cut lay which is raised by said stream of air between said elements and means for opening said gripper elements when said gripper and plate are in the second position so as to release said one piece of the cut lay.

2. A device as claimed in claim 1, wherein the downstream end of said plate is curved upwardly so that said flow of the air stream thereover creates an aerodynamic lift.

3. A device as claimed in claim 1, wherein the gripping means comprises a plurality of discs which are normally urged away from each other by a spring.

4. A device as claimed in claim 1, wherein the gripping means comprises a coil spring having two or more turns which are normally spaced apart, said turns comprising said gripping elements.

5. A device as claimed in claim 4, wherein a body extends axially through said coil spring and means are provided for moving the spring relative to the body so that the turns of the spring move towards each other for the purpose of gripping a piece of a cut lay therebetween.

6. A device as claimed in claim 5, wherein a piston and cylinder are provided for moving the plate and hence producing relative movement of the cut lay and the plate.

7. A device as claimed in claim 4 wherein said turns of said coil spring are approximately hemispherical in cross section, the flat surface of the hemisphere facing away from said horizontal plate and towards said cut lay.

\* \* \* \* \*

50

55

60

65

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,877,695 Dated April 15, 1975

Inventor(s) George Carroll

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the title page between lines 5 and 6, add the following:

-- Assignee: The Marine Engineering Company (Stockport) Ltd. --

**Signed and Sealed this**

*second Day of December 1975*

[SEAL]

*Attest:*

**RUTH C. MASON**  
*Attesting Officer*

**C. MARSHALL DANN**  
*Commissioner of Patents and Trademarks*

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

PATENT NO. : 3,877,695  
DATED : April 15, 1975  
INVENTOR(S) : George Carroll

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the title page of the patent, left column, line 5, change "Cheti" to --Cheshire--.

Signed and Sealed this

twenty-third Day of September 1975

[SEAL]

Attest:

RUTH C. MASON  
Attesting Officer

C. MARSHALL DANN  
Commissioner of Patents and Trademarks