



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11)

**EP 1 355 033 A2**

(12)

## EUROPEAN PATENT APPLICATION

(43) Date of publication:  
**22.10.2003 Bulletin 2003/43**

(51) Int Cl.7: **E06B 9/266**

(21) Application number: **03252499.3**

(22) Date of filing: **17.04.2003**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IT LI LU MC NL PT RO SE SI SK TR**  
Designated Extension States:  
**AL LT LV MK**

(72) Inventor: **Wilson, Neil**  
**Glasgow, Scotland G61 2DH (GB)**

(74) Representative: **Harrison Goddard Foote**  
**Belgrave Hall**  
**Belgrave Street**  
**Leeds LS2 8DD (GB)**

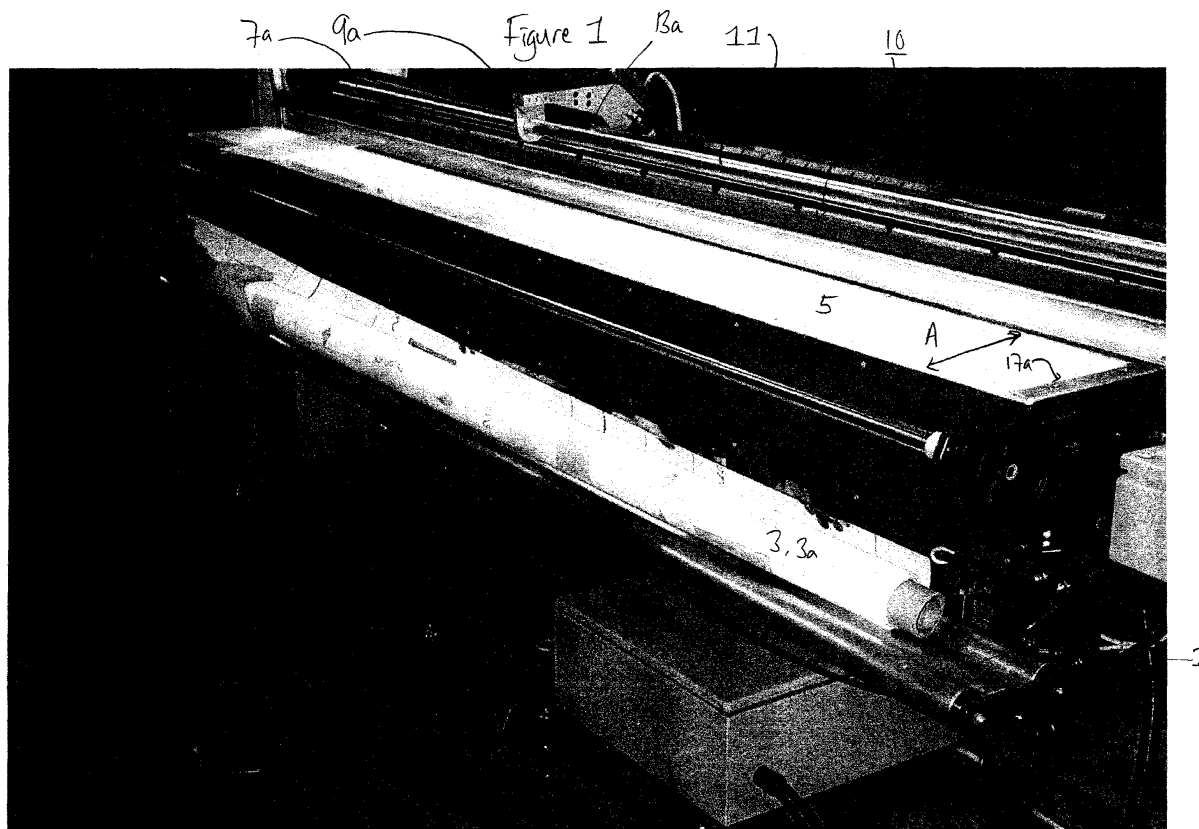
(30) Priority: **17.04.2002 GB 0208851**

(71) Applicant: **Turnils (UK) Limited**  
**Renfrew, Scotland PA4 9RE (GB)**

### (54) Apparatus and method for the production of roller blinds

(57) Apparatus (10) for use in the manufacture of roller blinds includes means (9,9a) for mounting and rotating one or more roller blind tubes (11), means (7) for aligning the fabric (3a) and means (13,13a) for cutting the fabric (3a) to a desired width. Each of these means is arranged in a fix angular arrangement with respect to

the other. The mounting means (9,9a) are adjustable to accommodate roller blind tubes (11) of different lengths and the width cutting means (13,13a) are adjustable also. Preferably an adjustable width cutting means (13,13a) and an adjustable mounting means (9,9a) are mounted on a common bracket (23) for adjustment in a single step.



**EP 1 355 033 A2**

## Description

**[0001]** The present invention relates to a new apparatus for the production of roller blinds and to a method of producing roller blinds employing the apparatus.

**[0002]** Roller blinds are well known and generally comprise a tube or cylinder around which a body of fabric is wound. The tube carrying the fabric is mounted in a window casement so that the tube can rotate, generally against a spring bias, to unroll the fabric and so cover the window.

**[0003]** Mounting of the fabric on the roller blind tube during manufacture presents a number of problems. Clearly a roller blind must be manufactured in a size which corresponds to the size of the window in which the blind is to be mounted. This in turn means that the fabric must be cut to size in terms of both of its length and its width before it can be mounted on the roller blind tube. After the fabric has been cut to size, it must be mounted in the correct orientation on the roller blind tube. Conventionally, the fabric is cut on a large cutting table which must be at least as large as the largest piece of fabric to be used in blind manufacture when laid out flat. Each side of the fabric is cut individually, for example using a guillotine-type roller cutter and great care and attention is required to ensure that the sides are cut straight and that adjacent sides are perpendicular (and opposite sides are parallel) so that a perfectly rectangular piece of fabric is formed. This is time consuming and subject to inaccuracies.

**[0004]** The cut fabric is conventionally mounted manually on the roller blind tube, with the correct alignment being judged by eye. This requires considerable skill as only a small misalignment can result in an unsatisfactory blind. The fabric then has to be rolled onto the tube evenly to ensure the edges are perpendicular to the tube and do not cone to one side. Where such coning occurs, small strips of fabric may need to be inserted at the edge of the fabric as it is rolled to correct the coning. The depth of insertion of these fabric corrector strips must be judged and adjusted to provide the correct degree of coning correction. The fabric also has to be rolled at the correct tension to avoid coning problems when the blind is operated.

**[0005]** The present invention seeks to overcome all the above problems and provides an apparatus for cutting fabric and mounting the cut fabric on a roller blind tube such that the fabric is cut automatically to the correct size and is automatically mounted on the roller blind tube in the correct alignment. The apparatus of the invention produces correctly cut, tensioned and aligned fabric on a roller blind tube in approximately 25% of the time of the conventional method, and requiring approximately 25% of the space. In variations of the invention, the apparatus can be modified to accommodate more than one roller blind tube so that a plurality of roller blinds can be manufactured at the same time.

**[0006]** According to a first aspect of the present inven-

tion there is provided an apparatus for use in the manufacture of a roller blind comprising:

- (i) drive means for feeding a web of fabric through the apparatus parallel to a first direction;
- (ii) alignment means for aligning the web of fabric with respect to the first direction;
- (iii) first and second roller blind tube mounting means for mounting a roller blind tube on the apparatus by its respective ends such that the longitudinal axis of the tube lies in a second direction perpendicular to the first direction, wherein at least one of the mounting means is adjustable in the second direction in order to mount roller blind tubes of different lengths;
- (iv) roller blind tube drive means for driving one of the mounting means to rotate the roller blind tube about its longitudinal axis;
- (v) width cutting means for cutting the web of fabric to a desired width in accordance with the length of the roller blind tube

wherein the alignment means, mounting means and cutting means are mounted in fixed angular relation with respect to one another.

**[0007]** Most preferably, in this apparatus the width cutting means comprise at least a first width cutting means which is adjustable in the second direction and is mounted in fixed angular relation to the alignment means and the mounting means. In a particularly preferred embodiment, the adjustable width cutting means is mounted in fixed relation to the adjustable mounting means, for movement therewith.

**[0008]** In an especially advantageous arrangement of the apparatus the adjustable mounting means and the adjustable width cutting means are mounted on a common bracket, which bracket is mounted for slideable movement parallel to the second direction. Preferably means are provided for locking the common bracket in a desired location after adjustment.

**[0009]** According to a second aspect of the present invention there is provided apparatus for use in the manufacture of roller blinds comprising:

- (i) drive means for feeding a web of fabric through the apparatus parallel to a first direction;
- (ii) alignment means for aligning the web of fabric with respect to the first direction;
- (iii) mounting components for mounting  $n$  roller blind tubes, where  $n$  is an integer greater than 1, such that the longitudinal axis of each roller blind tube lies in a second direction perpendicular to the first direction, said mounting components comprising first mounting means for mounting a proximal end of a first roller blind tube, second mounting means for mounting a distal end of a final roller blind tube and  $n-1$  intermediate mounting means for mounting adjacent respective proximal and distal ends of in-

intermediate roller blind tubes, or, where  $n=2$  for mounting the distal end of the first roller blind tube and the adjacent proximal end of the second roller blind tube, the second and intermediate mounting means being adjustable in the second direction in order to mount roller blind tubes of different lengths; (iv) roller blind tube drive means for driving one of the mounting means to rotate the roller blind tubes about the longitudinal axis and; (v) a plurality of width cutting means for cutting the web of fabric to a desired widths in accordance with the respective lengths of the roller blind tubes wherein the alignment means, mounting means and cutting means are mounted in fixed angular relation with respect to one another.

**[0010]** Most preferably, in this apparatus at least  $n$  of the width cutting means are adjustable in the second direction and are mounted in fixed angular relation to the alignment means and the mounting means. In a particularly preferred embodiment, the adjustable width cutting means are mounted in fixed relation to respective adjustable mounting means, for movement therewith.

**[0011]** In an especially advantageous arrangement of the apparatus each respective adjustable mounting means and adjustable width cutting means is mounted on a common bracket, which brackets are mounted for slideable movement parallel to the second direction. Preferably means are provided on each common bracket for locking the bracket in a desired location after adjustment.

**[0012]** In another preferred embodiment of these aspects of the invention the drive means comprise a pair of pinch rollers mounted with their axes of rotation parallel to the second direction and perpendicular to the first direction.

**[0013]** Preferably the apparatus further comprises a planar support surface over which the web of fabric is passed prior to the drive means.

**[0014]** In another preferred arrangement the alignment means comprises a planar surface disposed at one side of the support surface, said planar surface having a component parallel to the first direction and perpendicular to the second direction, and along which in use, the edge of the fabric makes running contact. Preferably also the planar support surface comprises a cutting guide for ensuring accurate cutting of the trailing end of the fabric. In a preferred form, the cutting guide comprises a linear groove disposed in the planar support surface. In order to hold the fabric in place during cutting, preferably the apparatus also comprises clamping means operable to hold the fabric against the planar surface during cutting of the trailing end of the fabric.

**[0015]** In another advantageous embodiment, the roller blind tube drive means includes a slipping clutch operative to maintain a desired tension in the web of fabric.

**[0016]** To assist in accurate cutting of the trailing end of the fabric, the apparatus preferably further comprises a brake operable to act on the roller blind tube drive means.

**[0017]** Preferably the apparatus of the invention further comprises means of introducing back tension to the web of fabric. Also the apparatus preferably comprises electronic control means operative to start and stop the respective drive means. In preferred forms of the invention, the control means is operative to stop the respective drive means at a predetermined point for cutting of the trailing end of the fabric. The control means may calculate the predetermined point in accordance with an operator input of a desired blind length.

**[0018]** Where the apparatus is provided with a brake, the control means is preferably operative to apply the brake as the trailing end of the fabric approaches the cutting means.

**[0019]** According to a third aspect of the invention there is provided a roller blind tube for use on the apparatus of the first and second aspects of the invention, comprising a hollow metal tube and a cutting guide for guiding cutting of the leading end of the fabric. Preferably, the cutting guide comprises a linear groove disposed in the external surface of the roller blind tube, and parallel to the longitudinal axis of the tube.

**[0020]** In one variation the roller blind tube includes a formation, operative to co-operate with a corresponding formation on the driven roller blind tube mounting means, whereby the roller blind tube is mountable on the apparatus only in a predetermined rotational orientation.

**[0021]** In a fourth aspect of the invention there is provided an apparatus as defined in first or second aspects of the invention further comprising a roller blind tube as defined in the third aspect of the invention.

**[0022]** A fifth aspect of the invention provides an assembly for use in the manufacture of a roller blind comprising a roller blind tube as defined in the third aspect of the invention and a body of fabric wound around the roller blind tube. In preferred such assemblies, the edges of the body of fabric are parallel to the respective ends of the roller blind tube and/or the trailing end of the body of fabric is parallel to the longitudinal axis of the roller blind tube.

**[0023]** A sixth aspect of the invention provides a roller blind including a roller blind tube as defined in the fourth aspect of the invention or including an assembly as defined in the fifth aspect of the invention..

**[0024]** According to a seventh aspect of the invention there is provided a method of producing an assembly for use in the manufacture of a roller blind, said assembly comprising a roller blind tube with a body of fabric wound thereupon, the method comprising the steps of:

- (i) providing an apparatus as claimed in claim 1;
- (ii) providing a roller blind tube;
- (iii) mounting a first end of the roller blind tube on

the driven roller blind tube mounting means;

(iv) adjusting the location of the adjustable roller blind tube mounting means and mounting the second end of the roller blind tube on said adjustable roller blind tube mounting means;

(v) adjusting the location of the width cutting means at at least one side of the apparatus in accordance with the desired width of the body of fabric.

(vi) aligning a web of fabric with the alignment means;

(vii) driving the respective driving means to drive the web of fabric through the apparatus via the width cutting means until the leading end reaches the roller blind tube;

(viii) stopping the drive means and mounting the leading end of the web of fabric on the roller blind tube;

(ix) re-starting the respective drive means and driving a predetermined length of fabric through the apparatus via the width cutting means;

(x) stopping the respective driving means;

(xi) cutting the trailing end of the fabric along a line perpendicular to the adjacent means;

(xii) re-starting the respective driving means; and

(xiii) optionally, applying a brake to the driving means of the roller blind tube mounting means to slow said means as the trailing end of the web of fabric is cut by the width cutting means.

**[0025]** In a preferred embodiment of this seventh aspect of the invention, the adjustable roller blind tube mounting means and the adjustable width cutting means are mounted in fixed relation to each other whereby steps (iv) and (v) are performed in a single operation.

**[0026]** A preferred variation of this aspect of the invention includes, after step (viii), the step of (viii)a cutting the leading edge of the web of fabric so that it is parallel to the longitudinal axis of the roller blind tube. Preferably, the roller blind tube includes a cutting guide in its external surface in the form of a linear groove parallel to the longitudinal axis of the roller blind tube, and said step (viii)a comprises cutting said leading edge with a knife by guiding the knife blade in said groove.

**[0027]** In another preferred embodiment of this aspect of the invention, the method further comprises providing a slipping clutch for the roller blind tube driving means and maintaining a desired tension in the web of fabric by means of said slipping clutch.

**[0028]** In another preferred variation of this aspect of the invention the method further comprises, in step (xi), providing a planar support surface having a cutting guide in the form of a linear groove perpendicular to the alignment means and cutting said trailing end by guiding a cutting knife along said groove.

**[0029]** A further preferred variation of this aspect of the invention further comprises the step of providing clamping means and clamping the web of fabric against

a support surface and in step (xi) cutting the trailing end of the web of fabric proximate said clamping means.

**[0030]** Preferably, the method of this aspect of the invention further comprises the step of introducing back tension into the web of fabric.

**[0031]** For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example only, to the following drawings, in which:

Figure 1 is a general perspective view of the apparatus according to the invention;

Figure 2 is a perspective view of the apparatus according to the invention showing initial stages of feeding the fabric through the apparatus;

Figure 3 is a perspective view of the apparatus according to the invention showing a later stage of feeding the fabric through the apparatus;

Figures 4 and 5 show the mounting of the roller blind tube on driven end mounting means according to the invention;

Figures 6 and 7 show the mounting of the roller blind tube on idle end mounting means according to the invention;

Figures 8 and 9 show details of the locking means for idle end mounting means in respective unlocked and locked positions;

Figure 10 shows the attaching of the fabric to the roller blind tube;

Figure 11a is a schematic perspective view of an alternative roller blind tube and Figure 11b shows a detail of the attachment of the fabric to the roller blind tube of Figure 11a;

Figure 12 illustrates in more detail the width cutting of the fabric;

Figures 13 and 14 show the operation of the back tensioning means in the apparatus according to the invention;

Figure 15 shows the cutting of the trailing end of the fabric;

**[0032]** Referring now to the drawings, the apparatus (10) comprises fabric holding means (1) to support a body of fabric (3a) such as a roll of fabric prior to cutting to form a blind, a support surface (5) over which the web of fabric (3) passes in use, drive means (7) for moving the web of fabric (3) through the apparatus (10) and mounting means (9a, 9b) for a roller blind tube (11) onto

which tube (11) the web of fabric (3) is rolled in order to form the roller blind. As the web of fabric (3) passes through the apparatus (10), one or more width cutting means (13a, 13b) are provided to cut the web of fabric (3) to a desired width. Further means (15) are preferably provided to cut, or assist in cutting, the leading and/or trailing ends of the fabric (3), so that the fabric is cut to a desired length. To ensure that the web of fabric (3) is aligned in the desired orientation in the apparatus, alignment means (17a, 17b) are provided.

**[0033]** The web of fabric (3) may initially be folded or may be in the form of a bolt or roll. The fabric holding means (1) may take any suitable form, provided that the web of fabric (3) may be fed from said holding means without undue restriction. A simple fabric holding cradle (1) as illustrated in Figure 1 is normally sufficient.

**[0034]** From the fabric holding means (1), the web of fabric (3) passes over the support surface (5) in which a cutting guide (15) may be disposed, as will be described below. From the support surface (5), the web of fabric (3) passes on to fabric drive means (7) such as, for example, a pair of pinch rollers, which assist in moving the web of fabric (3) through the apparatus. The support surface (5) includes alignment means (17a) to ensure that the web of fabric (3) is correctly aligned in the apparatus (10), and that the alignment is maintained as the web of fabric (3) continues to pass through the apparatus (10). The alignment means (17a) preferably comprise a formation disposed at one side of the support surface (5), which formation includes a generally upright planar surface. The web of fabric (3) should pass through the apparatus (10) of the invention in a first direction indicated generally by arrow A and the plane of said generally upright planar surface includes at least a first component which is disposed exactly parallel to said first direction. Thus, alignment of the web of fabric (3) is achieved by ensuring that the side edge of the fabric (3) maintains a running contact with the generally upright planar surface. Preferably, the upright planar surface will be vertical, but some deviation from vertical is acceptable.

**[0035]** Where, as in the preferred embodiment, the fabric drive means (7) comprise pinch rollers (7a, 7b (7b not shown)), the rollers (7a, 7b) are arranged such that the alignment of the web of fabric (3) achieved by the alignment means is maintained and is not disrupted. Specifically the pinch rollers (7a, 7b) are arranged so that their axes lie perpendicular to the first direction A and perpendicular to the plane of the planar surface of the alignment means (17a).

**[0036]** In the illustrated embodiment, the web of fabric (3) passes around the upper pinch roller (7a) (see Figure 3) and on to the roller blind tube (11), around which it is rolled by the apparatus (10) of the invention. The roller blind tube (11) is a substantially rigid tube, preferably of metal but possibly of plastic or other suitable material. Cardboard tube may be used in some cases. The web of fabric (3) is rolled around the tube and, in further man-

ufacturing stages not part of this invention, the tube (11) is provided with suitable fixings such as end caps and brackets to form a blind which may be mounted in a window. It is also possible that the roller blind tube (11) may take the form of a solid rod, such as of wood, but this is less preferred.

**[0037]** The roller blind tube (11) is mounted on the apparatus (10) of the invention by suitable mounting means (9a, 9b) at its respective ends. One or both of the mounting means (9a, 9b) is driven to cause it to rotate, and thereby to rotate the roller blind tube (11) when mounted thereon. Preferably, only one of the mounting means is driven (hereinafter the "driven end mounting means" (9b)), the other (hereinafter the "idle end mounting means" (9a)) being able to rotate freely. Thus, when the roller blind tube (11) is mounted on the mounting means (9a, 9b), the roller blind tube (11) is rotatably driven so that, after the leading end of the web of fabric (3) has been attached to the roller blind tube (11), the fabric may be taken up onto the roller blind tube (11).

**[0038]** The particular form of the mounting means (9a, 9b) may be selected as desired provided that rotational drive is effectively transferred from suitable drive means (19) via the mounting means (9b) to the roller blind tube (11) and provided also that the mounting means (9a, 9b) maintain the roller blind tube (11) in a correct alignment. Specifically, the roller blind tube (11) must be maintained so that its axis of rotation (i.e. the longitudinal axis) is parallel to the axes of the pinch rollers (7a, 7b) and more particularly so that said axis of rotation is perpendicular to the first direction A and to said first component of the plane of the planar surface of the alignment means (17a). Generally, the mounting means (9b) will be such that drive is transferred to the roller blind tube (11) by frictional engagement of the mounting means (9b) with the inside surface of the roller blind tube (11). It may be desirable to provide co-operating features on the mounting means (9b) and the roller blind tube (11) to assist in the transfer of drive but this is not normally necessary. Such features may also be useful in ensuring that the roller blind tube (11) may be mounted on the mounting means (9b) only in one particular rotational orientation. For example, the roller blind tube (11) may be provided with a protruding formation on its inner surface which co-operates with a groove in the mounting means (9b) so that the roller blind tube (11) may be mounted on the mounting means (9b) only when the protrusion is aligned with the groove.

**[0039]** It is a particular feature of the present invention that the apparatus (10) is suitable for manufacturing roller blinds of various widths, to accommodate different window sizes, for example. Usually, it is desired that the width of the web fabric mounted on a roller blind tube (11) is exactly the same as the length of the roller blind tube, or only a few millimetres greater or smaller to suit the particular roller blind mechanism being used. Thus, the apparatus (10) of the invention accommodates roller blind tubes (11) of various lengths by providing that one

or both of the roller blind tube mounting means (9a, 9b) is adjustable in a second direction parallel to the axis of rotation of the roller blind tube (11) (and therefore perpendicular to the first direction A and to said first component of the plane of the planar surface of the alignment means (17a)). Preferably, the driven end mounting means (9b) is fixed and the idle end mounting means (9a) is adjustable. Thus, in order to mount a roller blind tube (11) on the apparatus of the invention, the position of the idle end mounting means (9a) may be adjusted so that, initially, the distance between the respective mounting means (9a, 9b) is greater than the length of the particular roller blind tube (11) to be used. One end of the roller blind tube (11) is then engaged with the driven end mounting means (9b) (see Figures 4 and 5) and the position of the idle end mounting means (9a) is re-adjusted so that it engages the other end of the roller blind tube (11) (see Figures 6 and 7). The idle end mounting means (9a) may then be fixed or locked in position by suitable means (21), such that the roller blind tube (11) is retained in its use position by the mounting means (9a, 9b).

**[0040]** Preferably, the idle end mounting means (9a) is disposed on a bracket (23) or the like which is slidably mounted on a bar or rail (25). The bar or rail (25) is arranged to be parallel to the desired axis of rotation of the roller blind tube (11), so that the bracket (23) for the idle end mounting means (9a) slides parallel to said axis. The means (21) for locking the idle end mounting means (9a) in position may comprise means for bringing a component of said bracket (23) into frictional engagement with the bar or rail (25). Suitable means (21) can be seen most clearly in Figures 8 and 9, in the form of a toggle clamp (22). In Figure 8, the toggle clamp (22) is in its released position so that the bracket (23) can slide on the rail (25) and in Figure 9 the toggle clamp (22) is in its locking position so that the bracket (23) is fixed with respect to the rail (25).

**[0041]** In one variation of the invention, the apparatus of the invention is adapted for the simultaneous manufacture of a plurality of roller blind tubes. In this variation, a first roller blind tube (11') is mounted on the driven end mounting means (9b) as described above. The idle end mounting means (9a) is modified (9a') to mount two roller blind tubes (11', 11'') along the same axis of rotation, that is, so that the two roller blind tubes are mounted "end to end". Thus, the modified idle end mounting means (9a') is adjusted in the same manner as described above with reference to means (9a) so that it engages the second end of the first roller blind tube (11'). A first end of the second roller blind tube (11'') is then mounted on the other side of the modified idle end mounting means (9a'). A further idle end mounting means (9a'') which is adjustable, preferably in the same manner as idle end mounting means (9a), is provided to mount the second end of the second roller blind tube (11''). Thus, rotational drive is transferred from the drive means (19) to the driven end mounting means (9b) which transfers drive to

the first roller blind tube (11') which in turn transfers drive to the modified idle end mounting means (9a') which transfers drive to the second roller blind tube (11''). Further additional roller blind tubes may be added by modifying the apparatus to include further additional modified idle end mounting means.

**[0042]** After having passed around the upper pinch roller (7a) in the embodiment illustrated, the leading edge of the web of fabric (3) must be attached to the roller blind tube (11) to allow the fabric (3) to be taken up onto the roller blind tube (11). This can be achieved by any suitable means but a preferred embodiment of the present invention is particularly convenient. In this embodiment, the outer surface of the roller blind tube is provided with one or more adhesive zones 27 such as one or more pieces of double-sided sticky tape. Most preferably, a single strip of such tape is provided running generally parallel to the longitudinal axis of the roller blind tube (11) and extending for substantially the whole length of the roller blind tube (11). In this way, the leading edge of the web of fabric (3) can be placed over the double sided sticky tape and firmly attached by means of a gentle pressure applied by, say, an operator's hand.

**[0043]** The present invention also provides means for ensuring that the leading edge of the web of fabric (3), when mounted on the roller blind tube (11), is cut straight and true, that is, that the leading edge is cut parallel to the second direction and the longitudinal axis of the roller blind tube (11) and perpendicular to the first direction (A) and to the first component of the plane of the planar surface of the alignment means (17a). The means for ensuring that the leading edge is cut straight and true comprise a cutting guide (29) which is in the appropriate alignment. In a preferred embodiment of the invention, the cutting guide (29) simply comprises a groove extending in the outer surface of the roller blind tube (11) exactly parallel to the longitudinal axis of the tube (11). Thus, when the roller blind tube (11) is mounted on the mounting means (9a, 9b), cutting the leading edge of the fabric with the guidance of the groove provides that the leading edge has the desired alignment as set out above. The apparatus of the invention may be provided with integral cutting means, but manual cutting of the leading edge of the web of fabric (3) with a craft knife is simple and effective. In use, the means (27) for attaching the leading edge of the web of fabric to the roller blind tube (such as the double-sided sticky tape) is disposed behind the cutting guide (29) (with respect to the direction of rotation of the roller blind tube (11)). The leading edge of the fabric (3) is applied to the means for attaching the fabric (27) with an overlap sufficient to ensure that the portion of the leading edge in front of the means for attaching the fabric (27) overlies the cutting guide (29). After the leading edge has been attached, the fabric (3) is cut along the cutting guide (29) and the waste fabric is disposed of.

**[0044]** An alternative arrangement for attaching the fabric (3) to the roller blind tube (11a) is illustrated in

Figures 11a and 11b. The roller blind tube (11a) in these figures includes a relatively wide longitudinal slot (31) with opposed retaining lips (33a, 33b). A strip (35) of resilient material such as of plastic is held in the slot (31) by the lips (33). As can be seen from Figure 11b, the leading edge of the fabric (3) is retained in the slot (31) around the strip (35) without the use of any adhesive means.

**[0045]** A particular feature of the apparatus and method according to the present invention is that the web of fabric (3) is cut by the apparatus to a desired width (normally in accordance with the length of a particular roller blind tube (11)) and that the resulting side edges of the fabric are straight and true. That is, the side edges are exactly parallel to each other and perpendicular to the leading edge, after the leading edge has been cut with the aid of the cutting guide. The apparatus of the invention is provided with one or a plurality of width cutting means (13a, 13b) (depending on the number of blinds being manufactured simultaneously) to cut the side edges of the web of fabric (3). At least one of the width cutting means (13a) is adjustable to accommodate different desired widths of the final roller blind. Most preferably, for the manufacture of a single blind, two width cutting means are provided, one of which (13a) is fixed and the other of which (13b) is adjustable. For the simultaneous manufacture of more than one roller blind, preferably one additional adjustable width cutting means (13a) is provided per additional blind. Both or all the width cutting means (13) are mounted on the apparatus so that their direction of cutting is exactly parallel to the first direction and to the plane of the planar surface of the alignment means (17) and exactly perpendicular to the second direction and to the longitudinal axis of the roller blind tube (11). The or each adjustable width cutting means (13a) is most preferably moveable in a direction parallel to the second direction and may be moveable independently of other components of the apparatus. However, in one particularly advantageous embodiment, the moveable width cutting means (13a) is mounted in fixed relation to the adjustable roller blind tube mounting means (9a). In the case of simultaneous manufacture of a plurality of blinds, each adjustable width cutting means (13a) is mounted in fixed relation to a corresponding adjustable roller blind tube mounting means (9a', 9a"). In a preferred embodiment of the invention, the adjustable roller blind mounting means (9a, 9a', 9a") and the adjustable width cutting means (13a) are mounted on a respective common bracket (23). As discussed above in relation to the adjustable roller blind mounting means, the or each bracket (23) is slideably mounted on a rail or bar (25). Any suitable fabric cutting means (13) may, in principle, be used in the present invention, including electric or pneumatic rotary scissors, but a particularly preferred cutting means comprises a crush cutter in the form of a suitable blade or wheel (37) having a cutting edge bearing on one of the pinch rollers (preferably the upper pinch roller) (see Figures 6 to 9). The respective cutting

means (13) are ideally provided with scrap fabric guides (39) (Figure 12) to direct the cut excess fabric away from the web of fabric which is to be taken up on the roller blind tube (11).

**[0046]** Following cutting of the fabric, the web of fabric (3) must be attached to a roller blind tube (11) and subsequently rolled up on the tube (11). It is essential that the fabric (3) is mounted on the roller blind tube (11) in exactly the correct alignment. That is, the side edges of the fabric (3) must be maintained exactly perpendicular to the axis of rotation of the roller blind tube (11). If this is not done, the edges of the fabric (3) become gradually offset from their proper location as the fabric is wound on to the tube (11). In the prior art method, the alignment of the fabric on the tube is judged largely by eye and involves aligning the leading edge of the fabric parallel to the axis of the roller blind tube. This requires considerable practice and skill and can be a significant cause of error since only a small mis-alignment can result in a significant off-setting of the fabric when wound onto the roller blind tube (i.e. "coning" of the fabric). In the present invention the or each adjustable width cutting means (13a) is mounted on the bracket (23) so the line of action along which it cuts (and hence the side edge of the fabric (3) when cut) is in alignment with the edge of the end of the roller blind tube (11, 11', 11") which is mounted on the idle end mounting means (9a, 9a', 9a"), or is spaced a set distance from that end edge, normally not more than a few millimetres. Where, as is preferred, the driven end mounting means (9b) is fixed, the corresponding width cutting means (13b) is also fixed (non-adjustable). The fixed width cutting means (13b) is mounted on the apparatus so that the line of action along which it cuts (and hence the side edge of the fabric (3) when cut) is in alignment with the edge of the end of the roller blind tube (11) which is mounted on the driven end mounting means (9b), or is spaced a set distance from that end edge. The significant operational advantage which derives from the constructions where the adjustable width cutting means (13a) is in fixed relation to the adjustable mounting means (9a, 9a', 9a"), is that the operator does not need to make a separate adjustment of the adjustable width cutting means (13a) in order to accommodate roller blind tubes (11) of different lengths requiring correspondingly different widths for the fabric web (3). This advantage applies equally to the manufacture of a single blind or to the simultaneous manufacture of more than one blind. This means that, for example, it is not necessary for the operator to calculate the correct location of the or each moveable width cutting means (13a) and adjust it accordingly to achieve a desired width of cut fabric. Rather, the simple act of mounting the roller blind tube or tubes (11) on the roller blind tube mounting means (9a, 9a', 9a", 9b) automatically sets the moveable width cutting means (13a) in the correct location to achieve the desired width of fabric (3). Furthermore, the alignment means (17), and the fact that the roller blind tube(s) (11) is (are) mounted in fixed angular relation to

the alignment means (17), provides that the fabric (3) is automatically in the correct alignment for mounting on the roller blind tube(s) (11), with no operator adjustment of the correct alignment being required.

**[0047]** It is advantageous for ensuring accurate cutting of the fabric (3) to provide a degree of tension in the fabric (3) and the apparatus of the invention provides the required tension automatically by *inter alia* controlling the drive means (pinch rollers 7a, 7b) for the web of fabric and also those (19) for the driven end mounting means. In particular, the apparatus of the invention provides a required degree of back tension. To this end, the apparatus is provided with back tensioning means (41). One example of a suitable back tensioning means (41) is known in the art as a twitch bar and is illustrated in Figures 13 and 14. The twitch bar (41) comprises a pair of parallel bars (43, 45) mounted for rotation about an axis parallel to and located between the respective bars (43, 45). Preferably the axes of the bars (43, 45) and the axis of rotation lie in the same plane. The twitch bar (41) is preferably disposed between the fabric cradle (1) and the support surface (5). In use, with the parallel bars (43, 45) in an approximately horizontal orientation (i.e. with both their longitudinal axes lying approximately in the same substantially horizontal plane), the web of fabric (3) is fed between the bars and on to the support surface (5), so that the web of fabric (3) is fed over the support surface (5) in the first direction. The twitch bar (41) is then rotated through an appropriate angle, for example about 135°, whereby one of the parallel bars (43) displaces the fabric web (3) rearwardly (with respect to the first direction) and the other of the parallel bars (45) displaces the fabric web (3) forwardly. The fabric web (3) then follows a convoluted path around the parallel bars (43, 45), preferably passing first around the forwardly arranged bar (45) and passing in a generally rearward direction (with respect to the first direction) and then around the rearwardly arranged bar (43) so that the fabric (3) then moves in generally the first direction. In a particularly preferred arrangement, the back tensioning means (41) is provided with alignment means (17b) for the fabric (3). The alignment means (17b) of the back tensioning means (41) are disposed in exact alignment with the alignment means (17a) of the support surface (5) and again preferably comprises a planar surface disposed at one side of the back tensioning means (41), the plane of said planar surface including at least a component which is disposed exactly parallel to the first direction. In order to guarantee the correct alignment of the fabric web (3), the parallel bars (43, 45) of the twitch bar (41) should be mounted with their longitudinal axes perpendicular to the first direction and to the first component of the plane of the alignment means (17a) of the support surface (5).

**[0048]** In order to maintain a desired tension in the fabric (3) during cutting and rolling onto the roller blind tube (11), and especially in order to maintain a desired substantially constant tension, the drive means (19) for

the roller blind tube (11) is provided with a slipping clutch (47). Thus, if for some reason the tension in the web of fabric (3) provided from the drive means (19, 7a, 7b) for the fabric exceeds a certain desired value, the slipping clutch (47) will begin to slip, so that the tension in the fabric (3) is maintained essentially at the desired value. Rolling the fabric onto the roller blind tube (11) at the correct tension is important in preventing coning of the fabric when the finally produced blind is in use.

**[0049]** As mentioned above, the support surface is also preferably provided with a cutting guide (15). This cutting guide (15) is used to ensure accurate cutting of the fabric web (3) to form the trailing edge of the fabric. The cutting guide (15) may also be used, as an alternative to the cutting guide (29) on the roller blind tube, to ensure accurate cutting of the fabric web (3) to form the leading edge of the fabric. In a preferred and advantageously simple arrangement, the cutting guide (15) comprises a groove formed in the support surface (5). The groove is arranged to be straight and exactly parallel to the axis of rotation of the roller blind tube (11), hence also perpendicular to the first direction and to the first component of the plane of the alignment means (17a, 17b). In this way the trailing edge of the fabric (3) can be cut straight and true. Specific trailing end cutting means may be mounted on the apparatus of the invention to co-operate with the cutting guide, but this is not necessary. Where the cutting guide (15) is the groove as discussed above, the fabric (3) can simply be cut by using a suitable craft knife which is guided by the groove. Preferably means are provided to hold the fabric (3) firmly in position while the trailing end is being cut. Such means may be a clamping bar (49) aligned generally parallel to and close to the line along which the trailing edge is to be cut. The clamping bar (49) may, for example, be pneumatically operated.

**[0050]** The driving means for the roller blind tube mounting means (19) may preferably be provided with a brake 51 which is used towards the end of the process of rolling the web of fabric (3) onto the roller blind tube (11), in order to improve the finish of the trailing end of the fabric, as will be explained further below.

**[0051]** Finally, the apparatus of the invention is most preferably equipped with control means to automate at least some of the operational steps of the apparatus, as will be indicated further below.

**[0052]** The preferred processing steps using the preferred form of apparatus of the invention are described below. The sequence of steps indicated in this description is the preferred sequence, but variations in this sequence are not excluded.

**[0053]** Firstly, a roller blind tube (11) having a length appropriate to the desired width of the blind to be produced is selected, and this roller blind tube (11) is mounted on the driven end and idle end mounting means (9b, 9a). The roller blind tube (11) may be mounted in a desired rotational orientation with regard to the position of the cutting guide or other suitable feature of

the tube, but as the tolerances allowed for the length of the manufactured blind are usually generous, especially accurate rotational orientation of the roller blind tube (11) is not necessary. The position of the idle end mounting means (9a) is adjusted as necessary to accommodate the particular length of the roller blind tube (11). The idle end mounting means (9a) is then locked in position which thereby sets the adjustable cutting means (13a) in its correct location. The body of fabric (3a) is placed in the fabric cradle (1) and fed through the back tensioning means (twitch bar) (41) and on to the support surface (5). The edge of the web of fabric (3) is aligned with the alignment means (17a) of the support surface (5) and with the alignment means (17b) the twitch bar (41) and the twitch bar (41) is then rotated to introduce back tension into the fabric web (3).

**[0054]** The control means is then used to commence operation of the drive means (pinch rollers (7a, 7b)) and if the facility is provided to move the cutting means (13a, 13b) from a disengaged to an engaged position (i.e. where the crush cutters bear against the pinch roller (7a)). While checking and maintaining the alignment of the fabric (3) with the alignment means (17a, 17b), the leading edge of the web of fabric (3) is then fed through the pinch rollers (7a, 7b) and around the upper pinch roller (7a), where it meets the cutting means (13a, 13b) so that cutting of the fabric to the desired width begins. From the pinch rollers (7a, 7b), the leading edge of the fabric is guided manually to the mounted roller blind tube (11). When a sufficient length of fabric has been obtained, the control means is used to stop the drive means (7a, 7b) and the leading end of the fabric (3) is mounted on the roller blind tube (11) using suitable attachment means (27) - such as double-sided sticky tape - as discussed above.

**[0055]** While mounting the fabric web (3) on the roller blind tube, a suitable tension in the portion of the fabric between the leading edge and the pinch rollers (7a, 7b) is maintained manually. When the leading end of the fabric web has been mounted on the roller blind tube (11), the leading edge is cut straight and true using the cutting guide (29) in the roller blind tube (11) and a suitable knife.

**[0056]** After ensuring that the scrap fabric portions produced by the cutting means are fed correctly through the scrap fabric guides (39), the control means can be programmed with the type and required length (or "drop") of the blind. The control means then starts the fabric drive means (7a, 7b) and the drive means (19) for the roller blind tube mounting means, so that the fabric web (3) continues to be cut and the cut fabric web (3) is taken up onto the roller blind tube (11) in the correct alignment and with the required tension. After an interval of time calculated by the control means in accordance with the required drop of the blind, for example on the basis of a calculated number of rotations of the pinch roller (or alternatively, of the roller blind tube), the control means stops the respective drive means (7a, 7b, 19).

The point at which the drive means (7a, 7b, 19) are stopped is calculated by the control means so that the cutting guide (15) in the support surface (5) corresponds to the line along which the fabric web (3) should be cut to form the trailing edge.

**[0057]** Either at the instigation of the operator or of the control means, the clamping means (49) is moved to its clamping position and the fabric web (3) is cut by the operator along the cutting groove (15) in the support surface (5). The clamping means (49) is then moved from its clamping position.

**[0058]** The control means (if necessary as a result of an instruction input by the operator) then re-starts the drive means (7a, 7b, 19) so that most of the remainder of the fabric web (3) is taken up onto the roller blind tube. Towards the end of the process, the control means causes application of the brake for a short duration (which may be as little as one revolution) of the roller blind tube (11). From this point onwards, it is preferred that the operator applies a light pressure to the fabric wound on the roller blind tube (11), in order to maintain the tension of the fabric. By applying the brake, the tension in the fabric (3) at the point at which the cutting means are cutting the fabric is released or lessened. The point of application of the brake is selected to correspond with the time at which the trailing end of the fabric is passing the cutting means (13a, 13b). In this way, the fabric (3) towards the trailing end is cut straight and true (i.e. parallel to the first direction) and the problem of splaying of the end of the fabric is avoided. When all of the fabric has been rolled onto the roller blind tube, the trailing end can be secured with a piece of sticky tape in order to maintain the tension of the fabric. The roller blind can now be finished on the table if desired or the roller blind tube carrying the fabric can then be dismantled and sent for packing or such final finishing stages as might be required.

**[0059]** Where the apparatus of the invention is modified to manufacture more than one blind simultaneously, the first roller blind tube (11') is mounted as described above. When the first modified idle end mounting means (9a') has been set in position the second roller blind tube (11'') is mounted on the second side of the first modified idle end mounting means (9a'). A second modified idle end mounting means (9a'') is then adjusted to a position for mounting the second end of the second roller blind tube (11''). Alternatively, if the apparatus is constructed to accommodate more than two roller blind tubes, further modified idle end mounting means (9a''') and roller blind tubes (11''') are added to mount the respective ends of the roller blind tubes, ending with the second modified idle end mounting means (9a'') at the second end of the final roller blind tube.

## Claims

1. Apparatus for use in the manufacture of a roller

blind comprising:

- (i) drive means for feeding a web of fabric through the apparatus parallel to a first direction; 5
  - (vi) alignment means for aligning the web of fabric with respect to the first direction;
  - (vii) first and second roller blind tube mounting means for mounting a roller blind tube on the apparatus by its respective ends such that the longitudinal axis of the tube lies in a second direction perpendicular to the first direction, wherein at least one of the mounting means is adjustable in the second direction in order to mount roller blind tubes of different lengths; 10
  - (viii) roller blind tube drive means for driving one of the mounting means to rotate the roller blind tube about its longitudinal axis; 15
  - (ix) width cutting means for cutting the web of fabric to a desired width in accordance with the length of the roller blind tube 20
- wherein the alignment means, mounting means and cutting means are mounted in fixed angular relation with respect to one another. 25

2. Apparatus as claimed in claim 1 wherein the width cutting means comprise at least a first width cutting means which is adjustable in the second direction and is mounted in fixed angular relation to the alignment means and the mounting means. 30
3. Apparatus as claimed in claim 2 wherein the adjustable width cutting means is mounted in fixed relation to the adjustable mounting means, for movement therewith. 35
4. Apparatus as claimed in claim 3 wherein the adjustable mounting means and the adjustable width cutting means are mounted on a common bracket, which bracket is mounted for slideable movement parallel to the second direction. 40
5. Apparatus as claimed in claim 4 including means for locking the common bracket in a desired location after adjustment. 45
6. Apparatus for use in the manufacture of roller blinds comprising:

- (i) drive means for feeding a web of fabric through the apparatus parallel to a first direction; 50
- (vi) alignment means for aligning the web of fabric with respect to the first direction;
- (vii) mounting components for mounting n roller blind tubes, where n is an integer greater than 1, such that the longitudinal axis of each roller blind tube lies in a second direction perpendicular 55

ular to the first direction, said mounting components comprising first mounting means for mounting a proximal end of a first roller blind tube, second mounting means for mounting a distal end of a final roller blind tube and n-1 intermediate mounting means for mounting adjacent respective proximal and distal ends of intermediate roller blind tubes, or, where n=2 for mounting the distal end of the first roller blind tube and the adjacent proximal end of the second roller blind tube, the second and intermediate mounting means being adjustable in the second direction in order to mount roller blind tubes of different lengths;

- (viii) roller blind tube drive means for driving one of the mounting means to rotate the roller blind tubes about the longitudinal axis and;
- (ix) a plurality of width cutting means for cutting the web of fabric to a desired widths in accordance with the respective lengths of the roller blind tubes

wherein the alignment means, mounting means and cutting means are mounted in fixed angular relation with respect to one another.

7. Apparatus as claimed in claim 6 wherein at least n of the width cutting means are adjustable in the second direction and are mounted in fixed angular relation to the alignment means and the mounting means.
8. Apparatus as claimed in claim 7 wherein the adjustable width cutting means are mounted in fixed relation to respective adjustable mounting means, for movement therewith.
9. Apparatus as claimed in claim 8 wherein each respective adjustable mounting means and adjustable width cutting means is mounted on a common bracket, which brackets are mounted for slideable movement parallel to the second direction.
10. Apparatus as claimed in claim 9 including means provided on each common bracket for locking the bracket in a desired location after adjustment.
11. Apparatus as claimed in any preceding claim wherein the drive means comprise a pair of pinch rollers mounted with their axes of rotation parallel to the second direction and perpendicular to the first direction.
12. Apparatus as claimed in any preceding claim comprising a planar support surface over which the web of fabric is passed prior to the drive means.
13. Apparatus as claimed in claim 12 wherein the alignment means comprises a planar surface disposed

at one side of the support surface, said planar surface having a component parallel to the first direction and perpendicular to the second direction, and along which in use, the edge of the fabric makes running contact.

14. Apparatus as claimed in any of claim 13 wherein the planar support surface comprises a cutting guide for ensuring accurate cutting of the trailing end of the fabric.

15. Apparatus as claimed in claim 14 wherein the cutting guide comprises a linear groove disposed in the planar support surface.

16. Apparatus as claimed in claim 14 or 15 further comprising clamping means operable to hold the fabric against the planar surface during cutting of the trailing end of the fabric.

17. Apparatus as claimed in any preceding claim wherein the roller blind tube drive means includes a slipping clutch operative to maintain a desired tension in the web of fabric.

18. Apparatus as claimed in any preceding claim further comprising a brake operable to act on the roller blind tube drive means.

19. Apparatus as claimed in any preceding claim further comprising means of introducing back tension to the web of fabric.

20. Apparatus as claimed in any preceding claim further comprising electronic control means operative to start and stop the respective drive means.

21. Apparatus as claimed in claim 20 wherein the control means is operative to stop the respective drive means at a predetermined point for cutting of the trailing end of the fabric.

22. Apparatus as claimed in claim 21 wherein the control means calculates the predetermined point in accordance with an operator input of a desired blind length.

23. Apparatus as claimed in claim 20, 21 or 22 when dependent on claim 18 wherein the control means is operative to apply the brake as the trailing end of the fabric approaches the cutting means.

24. A roller blind tube for use on the apparatus of any preceding claim comprising a hollow metal tube and a cutting guide for guiding cutting of the leading end of the fabric.

25. A roller blind tube as claimed in claim 24 wherein

the cutting guide comprises a linear groove disposed in the external surface of the roller blind tube, and parallel to the longitudinal axis of the tube.

26. A roller blind tube as claimed in claim 24 or 25 including a formation, operative to co-operate with a corresponding formation on the driven roller blind tube mounting means, whereby the roller blind tube is mountable on the apparatus only in a predetermined rotational orientation.

27. Apparatus as claimed in any of claims 1 to 23 further comprising a roller blind tube as claimed in claim 24, 25 or 26.

28. An assembly for use in the manufacture of a roller blind comprising a roller blind tube as claimed in any of claims 24 to 26 and a body of fabric wound around the roller blind tube.

29. An assembly as claimed in claim 28 wherein the edges of the body of fabric are parallel to the respective ends of the roller blind tube and/or the trailing end of the body of fabric is parallel to the longitudinal axis of the roller blind tube.

30. A roller blind including a roller blind tube as claimed in claim 24, 25 or 26 or including an assembly as claimed in claim 28 or 29.

31. A method of producing an assembly for use in the manufacture of a roller blind, said assembly comprising a roller blind tube with a body of fabric wound thereupon, the method comprising the steps of :

(xiv) providing an apparatus as claimed in claim 1;

(xv) providing a roller blind tube;

(xvi) mounting a first end of the roller blind tube on the driven roller blind tube mounting means;

(xvii) adjusting the location of the adjustable roller blind tube mounting means and mounting the second end of the roller blind tube on said adjustable roller blind tube mounting means;

(xviii) adjusting the location of the width cutting means at at least one side of the apparatus in accordance with the desired width of the body of fabric.

(xix) aligning a web of fabric with the alignment means;

(xx) driving the respective driving means to drive the web of fabric through the apparatus via the width cutting means until the leading end reaches the roller blind tube;

(xxi) stopping the drive means and mounting the leading end of the web of fabric on the roller blind tube;

(xxii) re-starting the respective drive means

and driving a predetermined length of fabric through the apparatus via the width cutting means;

(xxiii) stopping the respective driving means;

(xxiv) cutting the trailing end of the fabric along a line perpendicular to the adjacent means; 5

(xxv) re-starting the respective driving means; and

(xxvi) optionally, applying a brake to the driving means of the roller blind tube mounting means to slow said means as the trailing end of the web of fabric is cut by the width cutting means. 10

**32.** A method as claimed in claim 31 wherein the adjustable roller blind tube mounting means and the adjustable width cutting means are mounted in fixed relation to each other whereby steps (iv) and (v) are performed in a single operation. 15

**33.** A method as claimed in claim 31 or 32 including, after step (viii), the step of (viii)a cutting the leading edge of the web of fabric so that it is parallel to the longitudinal axis of the roller blind tube. 20

**34.** A method as claimed in claim 33 wherein the roller blind tube includes a cutting guide in its external surface in the form of a linear groove parallel to the longitudinal axis of the roller blind tube, and said step (viii)a comprises cutting said leading edge with a knife by guiding the knife blade in said groove. 25 30

**35.** A method as claimed in any of claims 31 to 34 further comprising providing a slipping clutch for the roller blind tube driving means and maintaining a desired tension in the web of fabric by means of said slipping clutch. 35

**36.** A method as claimed in any of claims 31 to 35 further comprising, in step (xi), providing a planar support surface having a cutting guide in the form of a linear groove perpendicular to the alignment means and cutting said trailing end by guiding a cutting knife along said groove. 40 45

**37.** A method as claimed in any of claims 31 to 36 further comprising the step of providing clamping means and clamping the web of fabric against a support surface and in step (xi) cutting the trailing end of the web of fabric proximate said clamping means. 50

**38.** A method as claimed in any of claims 31 to 37 further comprising the step of introducing back tension into the web of fabric. 55

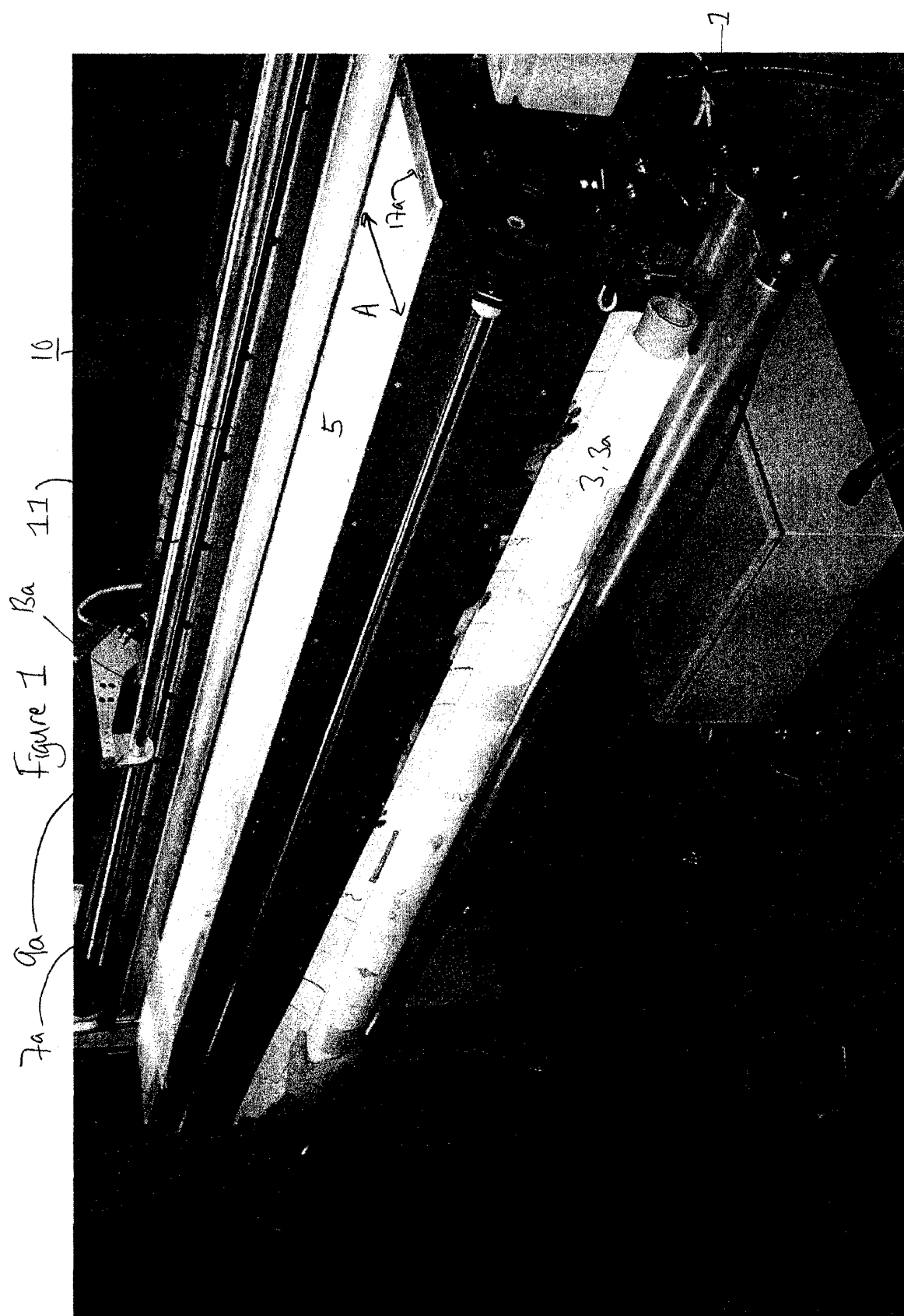


Figure 2

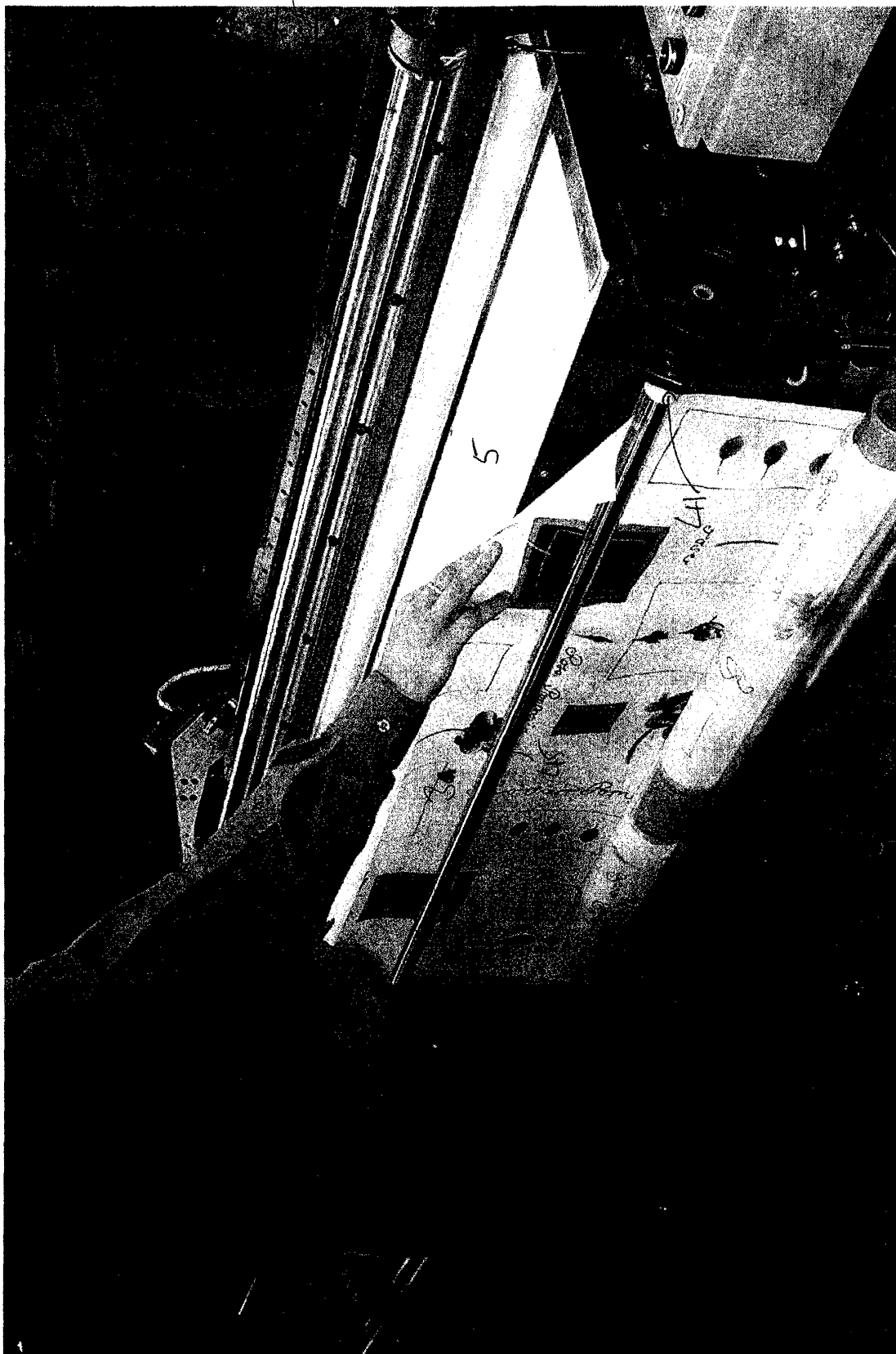


Figure 3

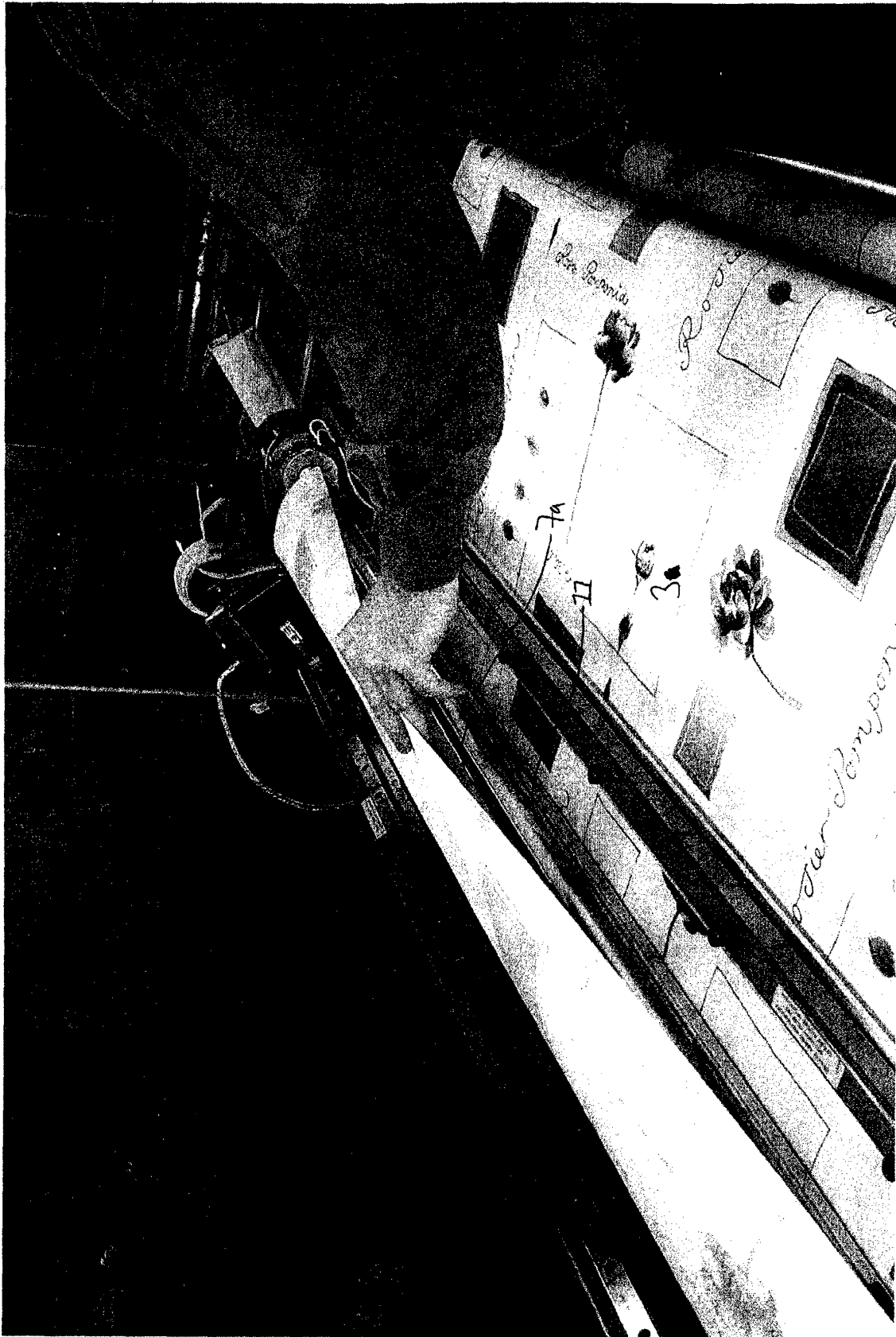


Figure 4

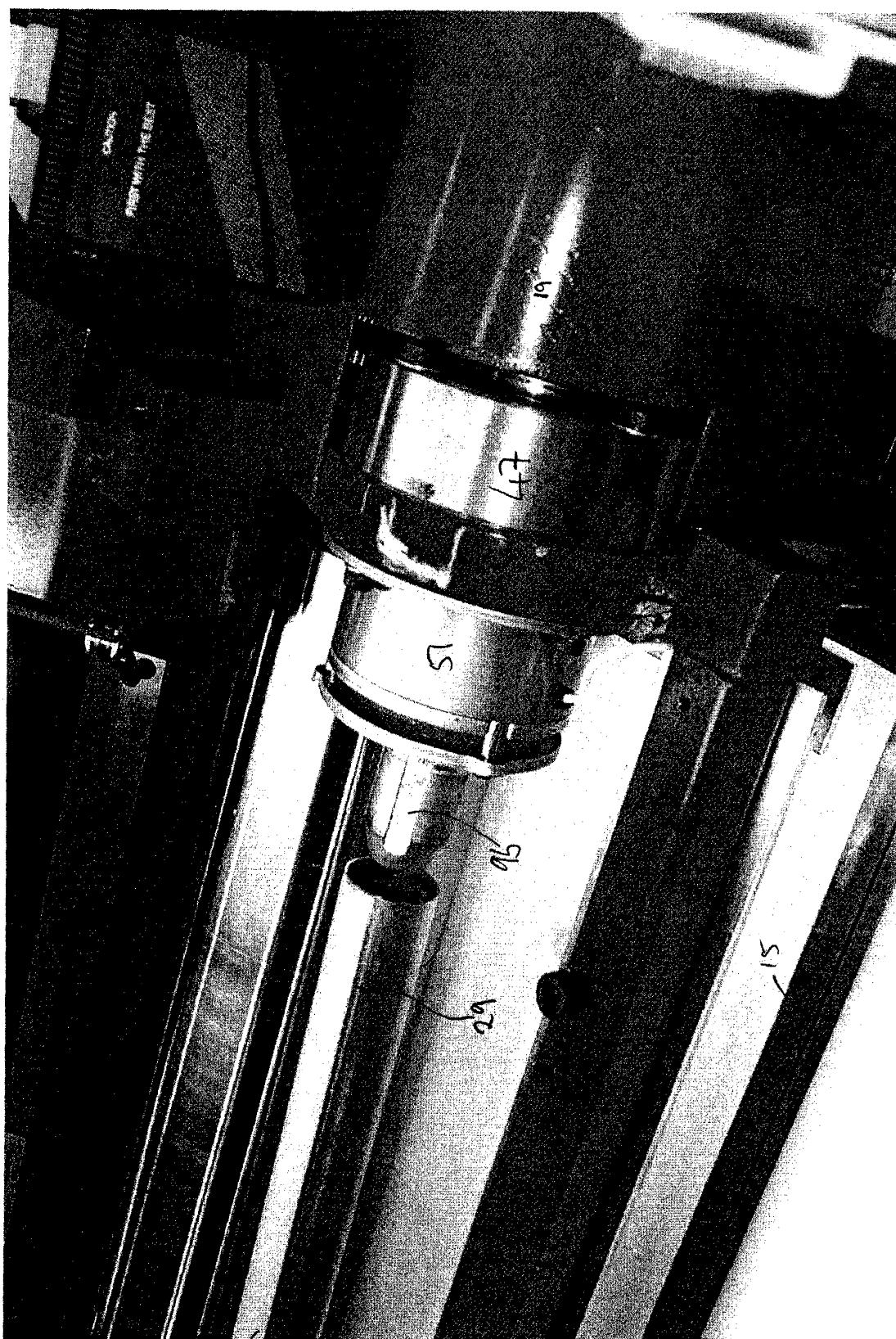


Figure 5

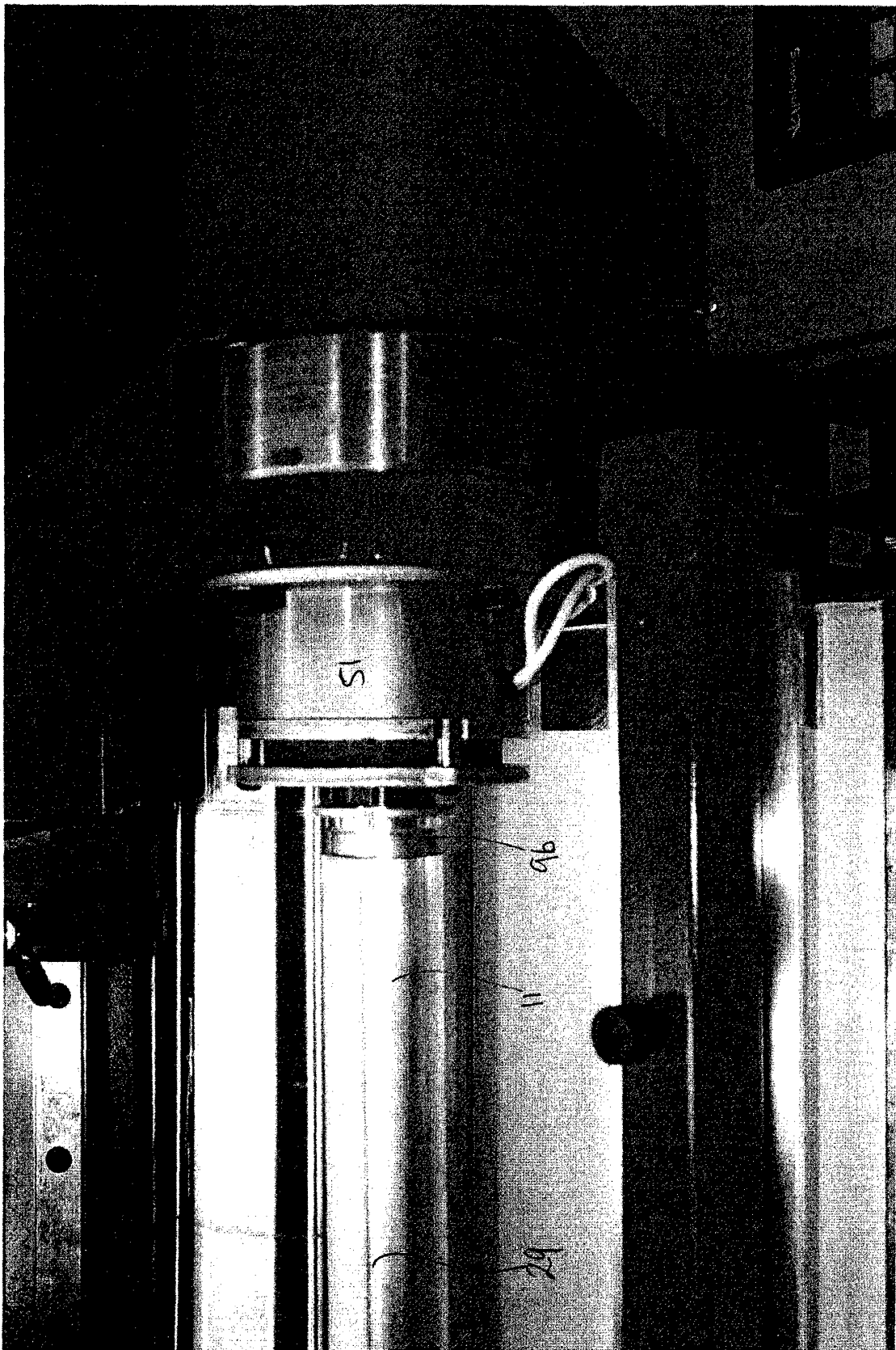


Figure 6



Figure 7



Figure 8

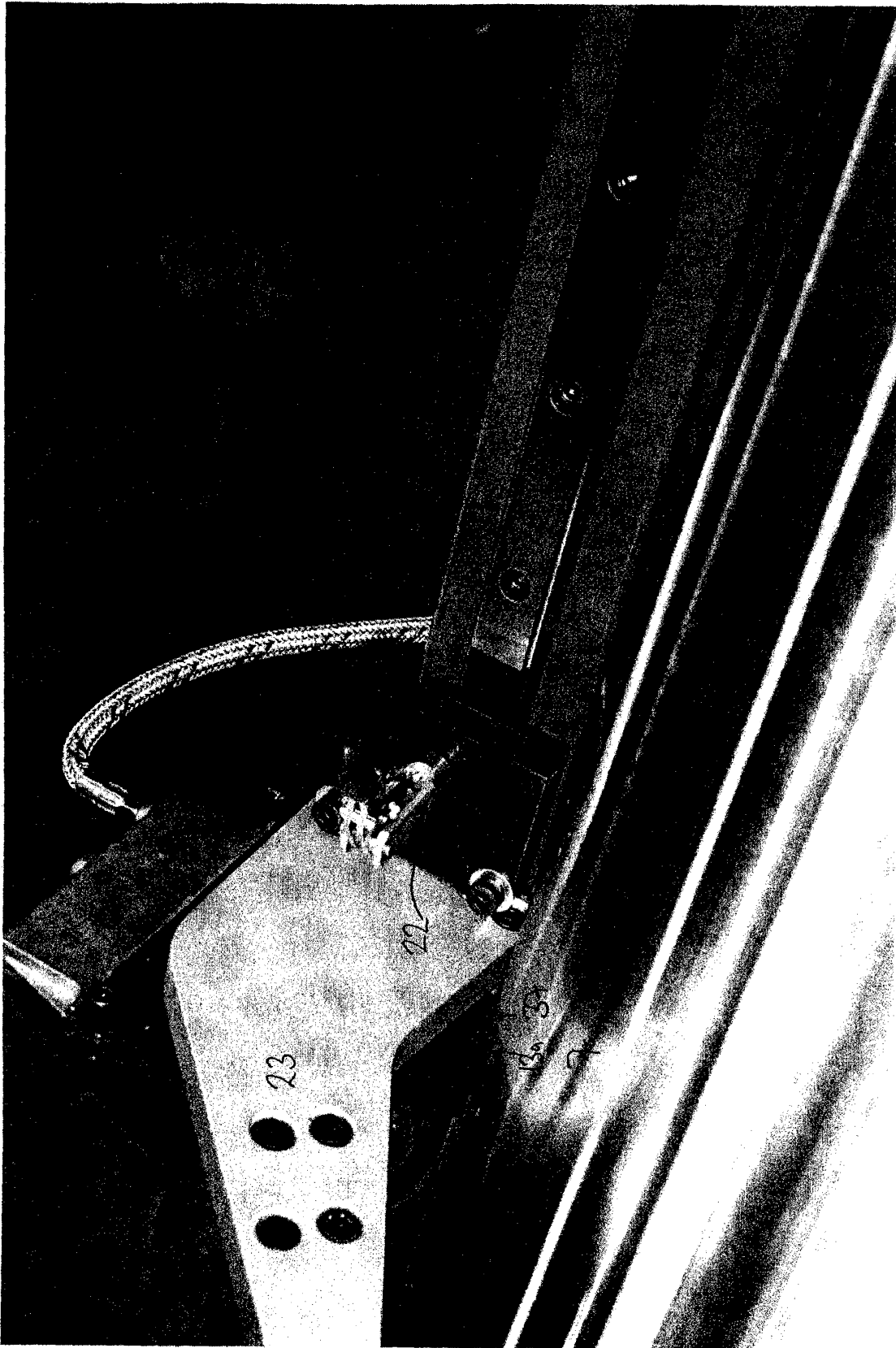


Figure 9

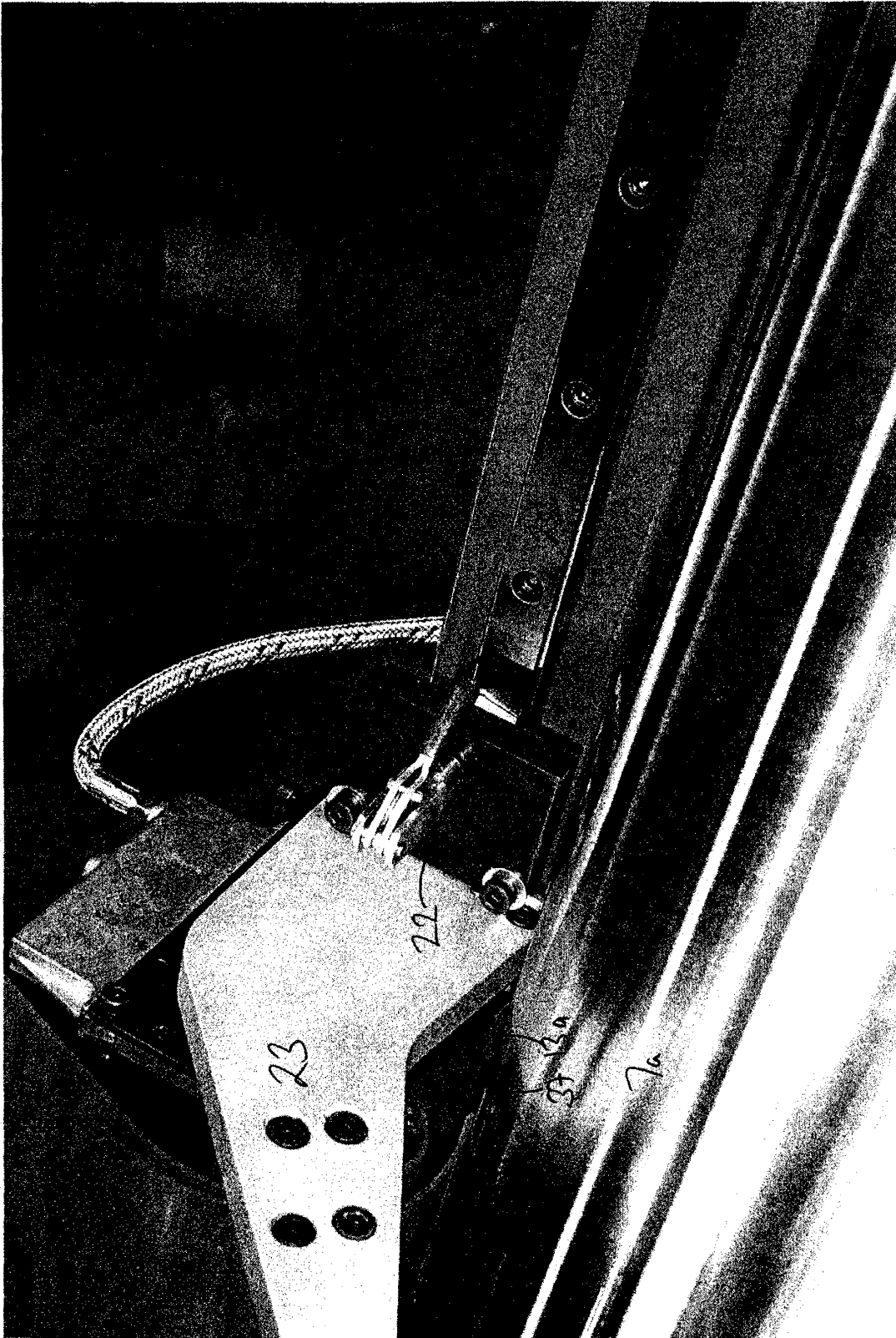
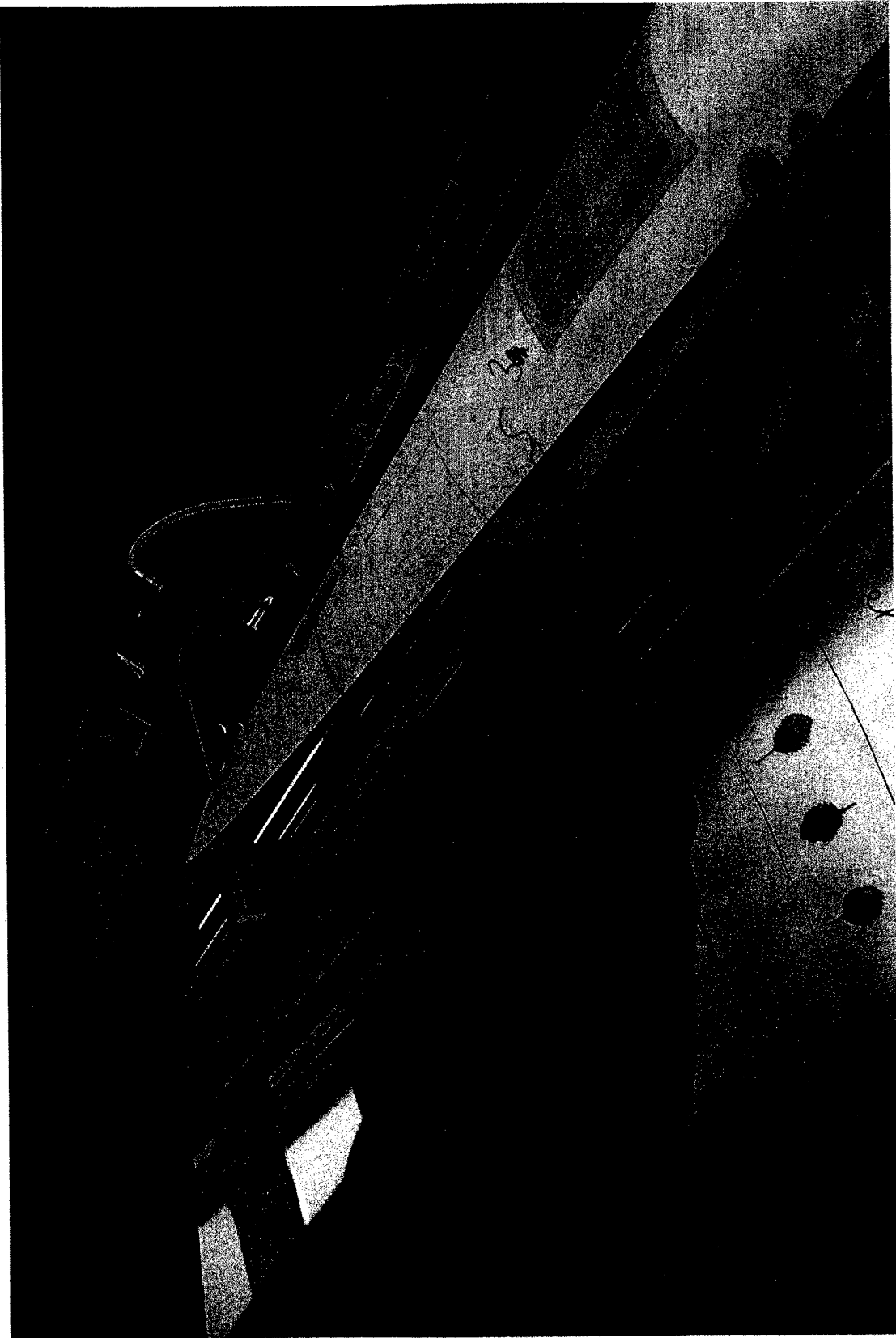


Figure 10



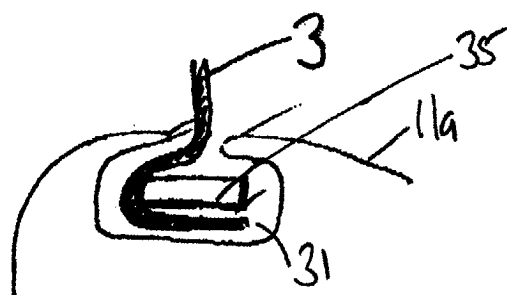
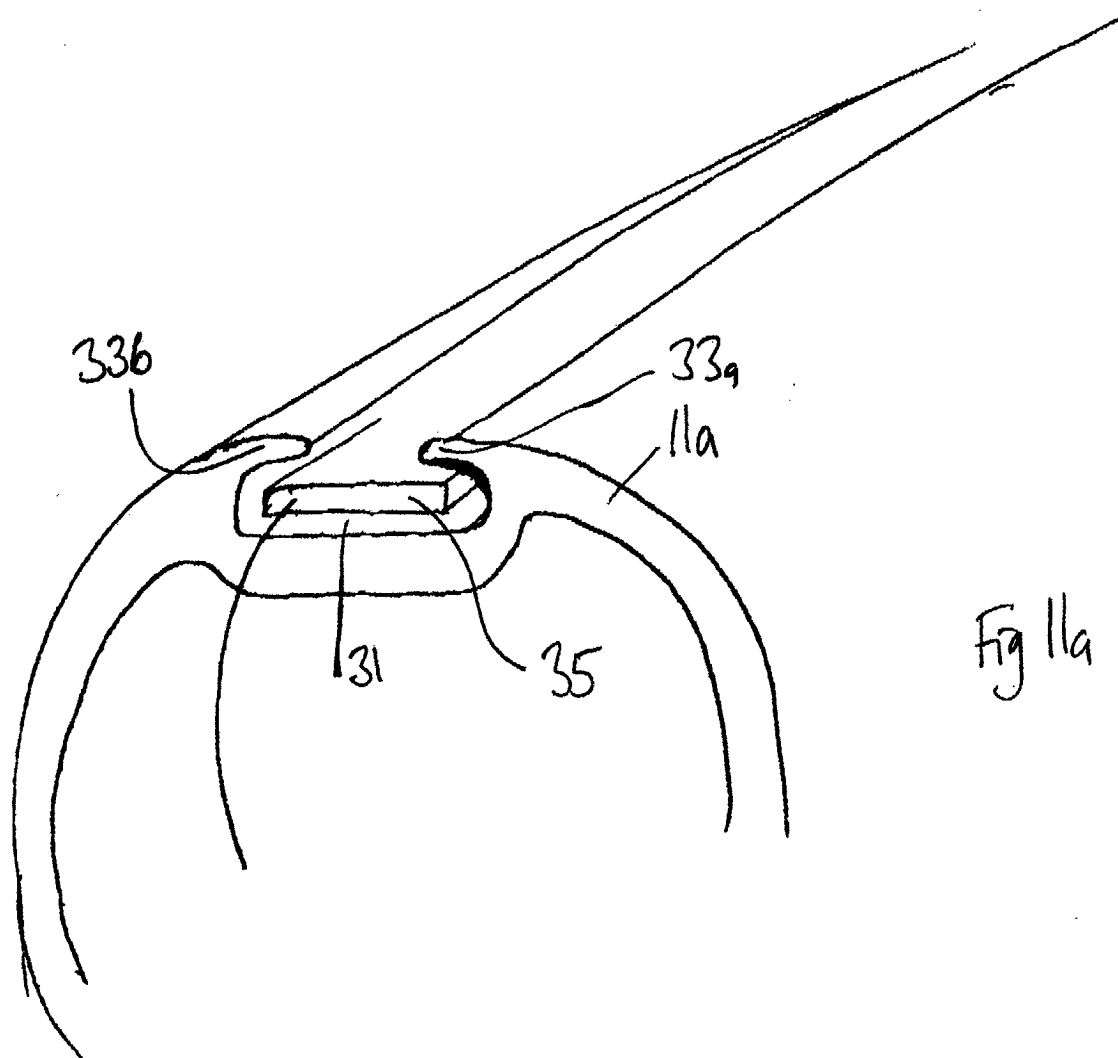
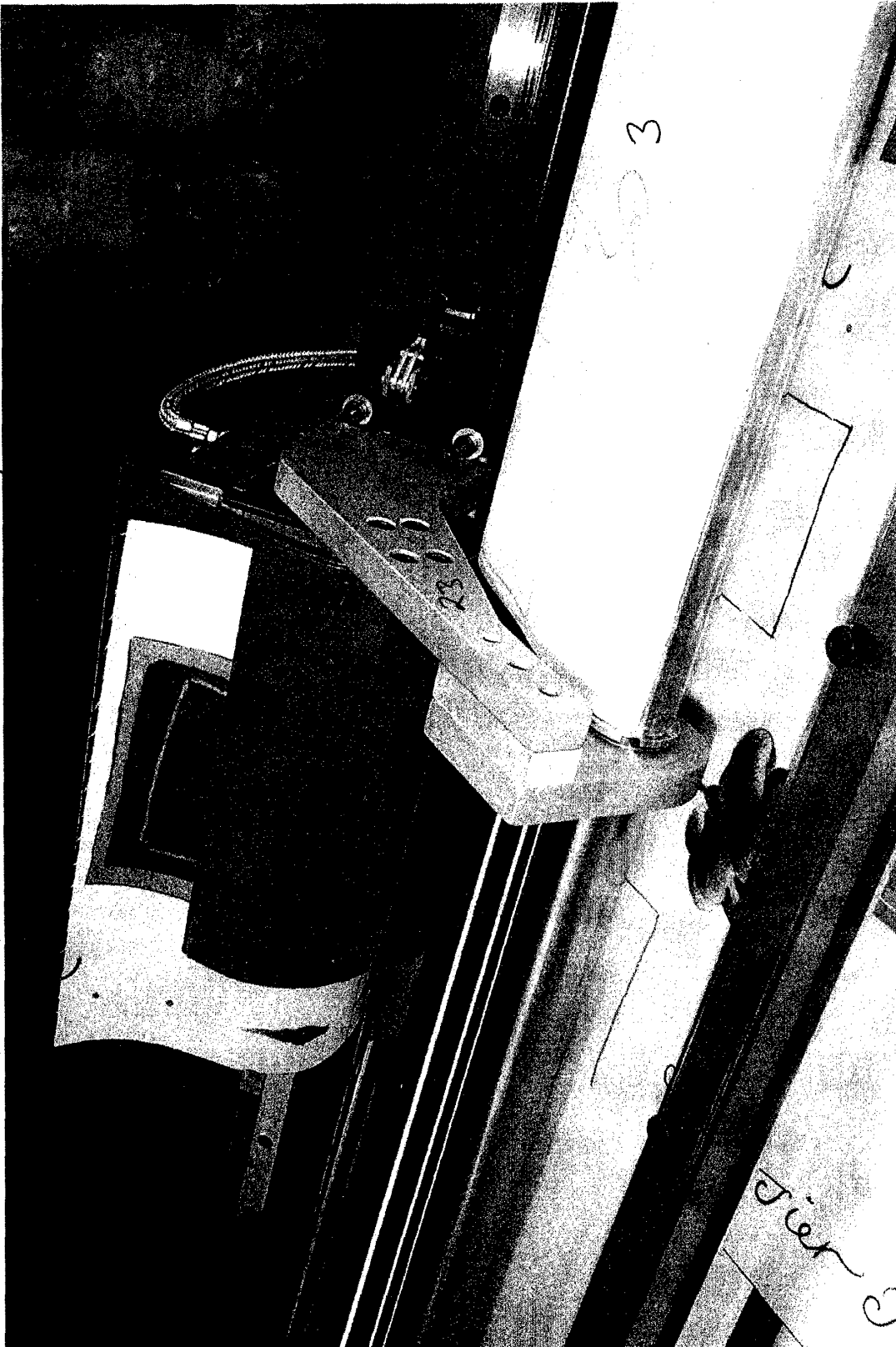
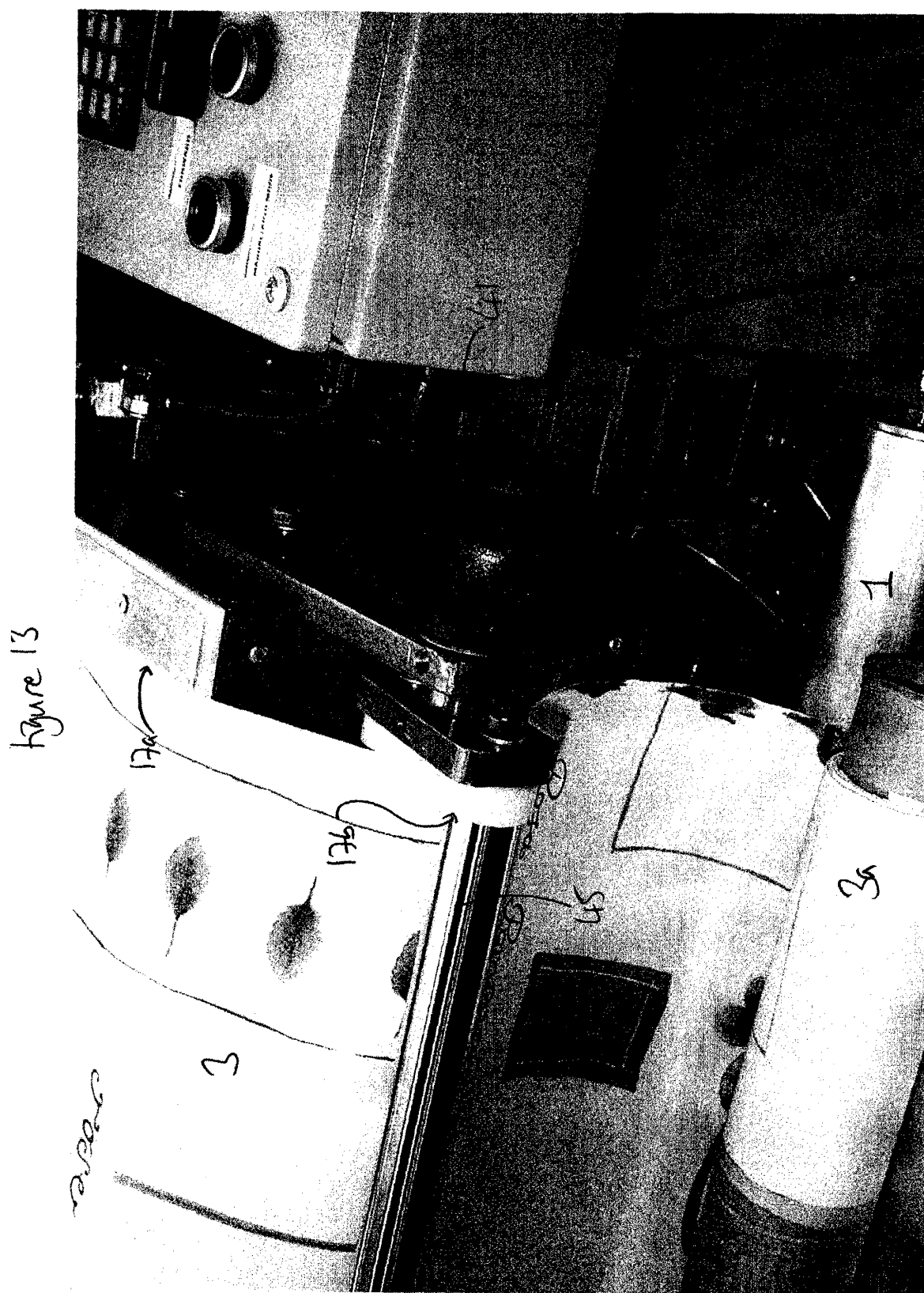


Figure 12  
39





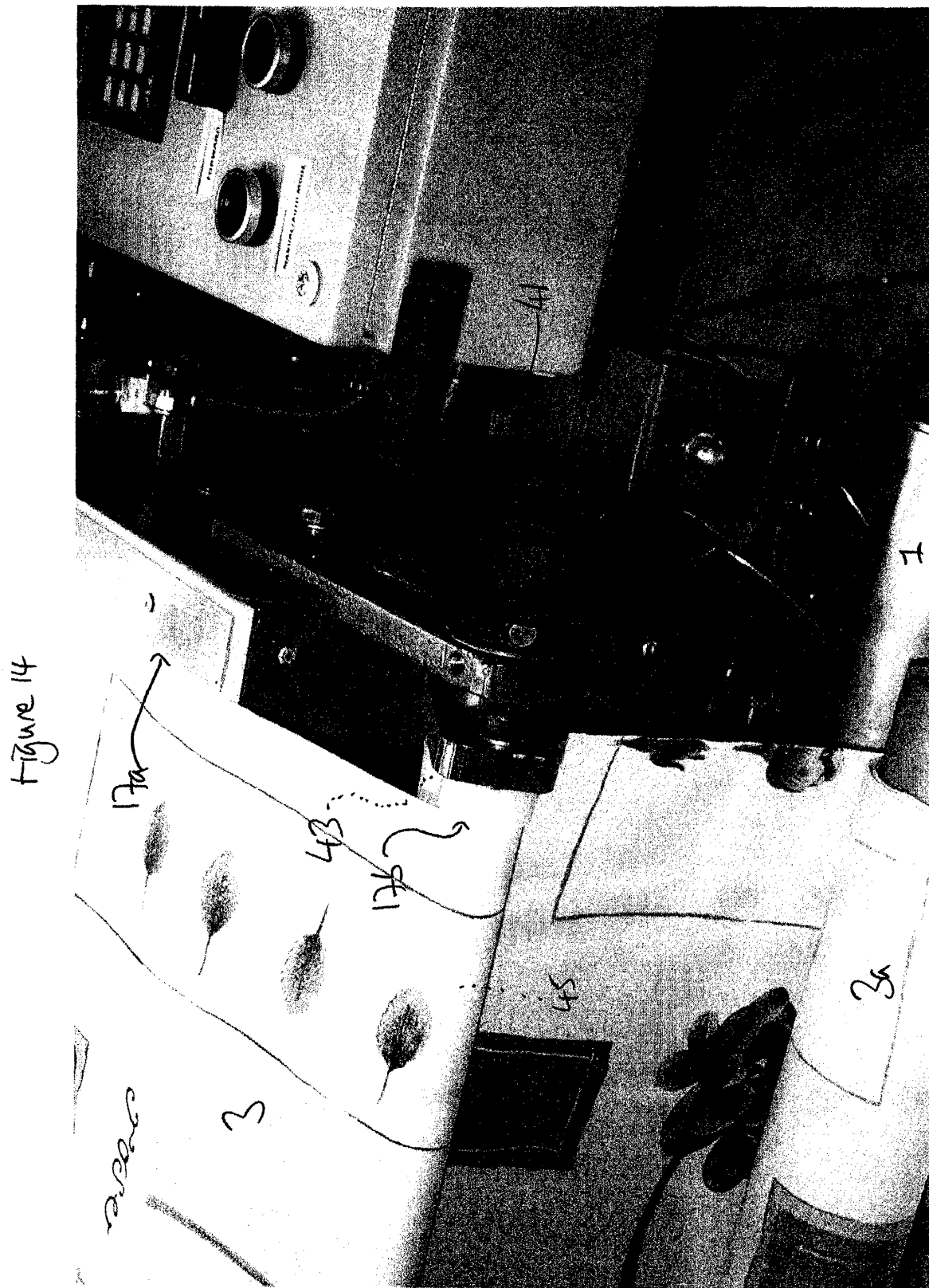


Figure 15

23 99

