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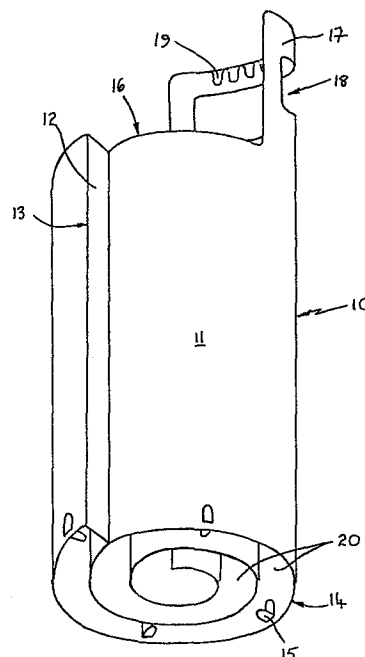
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Sheet processing apparatus.

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Apparatus for use in processing photographic sheet material by immersion in a liquid chemical in a cylindrical tank comprises a holder (10) in the form of an open spirally wound wall (11) which is open at one end (16) for insertion of the spirally wound sheet material and has stops (15) at the other end (14) to prevent the sheet material from falling therethrough. A handle (17, 18) is provided at the open end (16). The outermost longitudinally extending edge (13) of the wall (11) has a second wall (12) extending radially inwardly therefrom to retain the outermost edge of the sheet material.



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SHEET PROCESSING APPARATUS

This invention relates to apparatus for use in processing flexible sheet material, in which process the sheet material is immersed in a fluid medium so
5 as to effect some physical or chemical change in the sheet material. The invention has particular, but not exclusive application in the processing of photographic paper.

- 10 There are two principal forms of apparatus used in the processing of photographic paper. In one form of apparatus the sheet of paper is retained in a flat condition by the edges in a generally rectangular framework. The framework and paper is then immersed
15 in a generally rectangular tank in which the requisite chemical liquid is contained. Such a tank is of necessity relatively large if large photographic prints are to be processed therein, for example up to 508 cm x 762 cm paper sheets, and such tanks require large
20 quantities of the chemical concerned, for example up to 16 litres may be required. In consequence such tanks are relatively expensive to acquire and to use. In a second form of apparatus the sheet of paper is wrapped around the inside of a cylindrical drum in which
25 there is a relatively small amount of chemical, for example 50 ml. This chemical is presented to all of the inwardly facing surface of the paper sheet by movement of the drum and then the chemical is discarded after each processing operation. When this is done on a large
30 commercial scale it is wasteful of chemicals and is

therefore expensive in operation. Furthermore the size of the paper which can be processed in any particular drum is limited by the circumference, and hence the diameter, of the drum, a large drum being
5 required for the processing of large paper sheets.

In the processing of photographic film it is known to insert the film into a slot extending lengthwise of a cylindrical can so that the film winds up into a spiral
10 within the can. However, apparatus of this type cannot be used with photographic paper or many other flexible sheet materials since after only a short length has been inserted, the friction of the sheet material on the inner wall of the can resists further insertion and the sheet
15 material buckles adjacent the slot in the can.

It is an object of the present invention to provide apparatus for use in processing flexible sheet material such as photographic paper which does not have, or has
20 to a lesser extent, the disadvantages referred to above of the known forms of apparatus.

The invention provides apparatus for use in processing flexible sheet material comprising a container of
25 cylindrical form having at least one open end thereto and a first wall extending in an open spiral about a longitudinal axis of said container.

Preferably an opening is provided at the end of said
30 container opposed to said one open end, in which case both ends may be open or an opening or openings may be provided in said first wall or in an end wall of said container. If both ends are open, means may be provided at said opposed end to restrain passage of
35 said sheet material therethrough.

The container may also comprise a second wall extending longitudinally of said container and substantially radially thereof. Said second wall may be in the form of a closing member extending between the outermost,
5 longitudinally extending edge of said first wall and that part of said first wall one revolution of said spiral from said edge. Alternatively said second wall may be in the form of a lip provided at said outermost edge.

10

The container may also comprise a handle, which may be disposed adjacent said one open end. In this case said handle may be formed by an extension of said first wall in the longitudinal direction of said container. Said
15 extension may have an aperture therein to facilitate handling of said container and may have protrusions thereon to facilitate handling in a dark environment. Alternatively said handle may comprise a hook which may be detachably secured to said first wall through an
20 aperture therein.

The invention also comprises processing a flexible sheet material using a container as aforesaid, comprising the steps of rolling said sheet into a spiral
25 of smaller diameter than that of said container, inserting said spirally wound sheet into said container through said one open end, allowing said sheet to unwind so as to conform to the inwardly facing surface of said first wall and subjecting said sheet in said container
30 to a fluid treatment. The subjection step may comprise immersing said container in a liquid medium contained in a cylindrical tank, with said one open end uppermost.

Embodiments of apparatus in accordance with the invention
35 will now be described with reference to the accompanying drawings in which:-

- Fig. 1 is a perspective view from below of a first embodiment,
Fig. 2 is a front view of a second embodiment,
Fig. 3 shows a handle attached to the embodiment
5 of Fig. 2, and
Fig. 4 is a scrap perspective bottom end view of the embodiment of Fig. 2.

Referring now to Figure 1 there is shown a container
10 or holder 10 of cylindrical form and comprising an open
spirally wound first wall 11. A second or closing
wall 12 extends longitudinally and substantially
radially of the holder 10 and joins the outermost,
longitudinally extending edge 13 of wall 11 to that
15 part of wall 11 one revolution of the spiral from the
edge 13. The holder 10 is open at both ends but at
the end 14, which in use is to be the lowermost end
of holder 10, tabs 15 are formed by pressing inwardly
cut portions of wall 11. The tabs 15 prevent a sheet
20 from falling downwardly out of the holder 10. The
uppermost end 16 of holder 10 is also open and serves
as an inlet and outlet for the sheet to be processed.
At the end 16 the wall 11 is extended to form a handle
17, there being an aperture 18 in handle 17 to
25 facilitate handling of the container 10 or for hanging
purposes. Finger-grips 19 are also provided to
facilitate handling of container 10 in a dark
environment such as in a photographic darkroom.

30 In use of container 10, a sheet (not shown), for
example photographic paper, is rolled into a relatively
tight spiral and inserted into the inlet end 16 of the
container 10, the sensitive surface of the paper facing
inwardly. At the same time the restraining pressure on
35 the spirally wound paper is relaxed so that it may

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unroll and conform to the inwardly facing surface 20 of wall 11. When the paper is inserted into the holder 10 the latter may be immersed in a cylindrical tank containing the liquid chemical required for the processing of the paper, the liquid having ready access to the sensitive surface of the paper since only the reverse side of the paper is in contact with surface 20 of wall 11. When the processing step is completed the holder 10 is removed from the tank and the paper removed from the holder 10. A slight spiral-tightening torque applied to the outermost part of the paper will facilitate its removal from holder 10 by reducing the contact pressure between the paper and surface 20.

15 The container 10 is preferably made of a relatively thin sheet of plastics material, for example 0.75 mm thick polypropylene sheet. This is inert to the chemicals used in photographic processing and the mass of the holder 10 is sufficiently small for there to be only minimal lowering of the temperature of the chemical in the processing tank when the holder 10 is immersed therein. Although it is preferred that the holder 10 should be rigid so as not to deform from the spiral configuration, such a thin sheet of plastics material will have sufficient flexibility for handle 17 to be flexed outwardly so as to prevent the sheet catching on fingerrips 19 on removal from the holder 10.

Referring now to Figs. 2 to 4 there is shown a container or holder 21 of cylindrical form and comprising an open spirally wound wall 22. The outermost longitudinal edge of wall 22 is formed with a lip 23 to retain the outermost longitudinal edge of the sheet material during processing. The holder 21 is open at both ends and the edge 24 which is uppermost in use is cut at an angle

other than 90° to the longitudinal axis of the holder 21 (see Fig. 2). This provides that the inner top corner 25 of the holder 21 is higher in use than the outer parts of the top edge 24 so as to be readily accessible for the attachment of a handle 26 (see Fig. 3) through an aperture 27 located near to the top corner 25. Also the outwardly, downwardly inclined top edge 24 provides that the sheet material when placed in the holder 21 is readily accessible for removal after processing. The bottom edge 28 of holder 21 is dimpled at intervals therealong (see Fig. 4) to provide stops 29 to prevent the sheet material from falling out of the holder 21 when immersed in a treatment tank or during transportation. Alternative forms of stop will be readily apparent to persons skilled in the art, for example one or more diametrically disposed strips, a perforated plate, or a wire mesh may be secured across the bottom edge 28 or a continuous lip may be provided corresponding with the lip 23 provided along the longitudinal outer edge of holder 21. Each of these alternative forms of stop will assist in locating the successive turns of the spirally formed wall 22, and this is particularly advantageous if the holder 21 is of a relatively thin plastics material. However, as an alternative to the use of such a material, stainless steel may be used, in which case the holder 21 when rolled will have adequate rigidity without the bracing provided by the alternative stops suggested above.

The handle 26 is formed of stainless steel wire and bent to a hook shape as shown in Fig. 3. It can be readily attached and detached when required.

By means of the invention, relatively large sheets may be processed in a processing tank of relatively small

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diameter, for example 508 cm x 762 cm sheets can be held in a holder of 10 cm diameter or less. A tubular tank into which such a holder may be immersed may require only 5 litres of chemical therein, and such
5 chemical need not be discarded after each sheet is processed. Only one size of processing tank and holder are required for processing both large and small sheets, the maximum length of the sheet able to be processed in a holder being dependent only on the
10 number of revolutions of the spiral formed in the holder.

As an alternative to the location of the aperture 27 at the top corner 25 of the holder 21, as shown in
15 Figs. 2 and 3, the lip 23 may be formed so as not to extend to the top edge 24 of wall 22 and an aperture 27a may be provided in the unlipped part 22a of wall 22 as shown in dashed lines in Fig. 2.

Claims:

1. Apparatus for use in processing flexible sheet material comprising a container (10,21) of cylindrical form having at least one open end (16,24) thereto
5 characterised in that
a first wall (11,22) extends in an open spiral about a longitudinal axis of said container (10,21).
2. Apparatus according to claim 1,
10 characterised in that
both ends (14,16,24,28) of said container (10,21) are open.
3. Apparatus according to claim 2,
15 characterised in that
stop means (15,29) are provided adjacent said opposed end (14,28) to restrain the passage of said sheet material therethrough.
- 20 4. Apparatus according to claim 3,
characterised in that
said stop means (15,29) comprise a plurality of protrusions each formed by inwardly deforming a part of said first wall (11,22).
- 25 5. Apparatus according to any one of claims 1 to 4,
characterised in that
said container (10,21) comprises a second wall (12,23) extending longitudinally of said container (10,21) and
30 substantially radially thereof.
6. Apparatus according to claim 5,
characterised in that
said second wall (12) provides a closing member
35 extending between the outermost longitudinally

extending edge (13) of said first wall (11) and that part of said first wall (11) one revolution of said spiral from said outermost edge (13).

- 5 7. Apparatus according to claim 5,
characterised in that
said second wall (23) comprises a lip provided at the
outermost, longitudinally extending edge of said first
wall (22).

10

8. Apparatus according to any one of claims 1 to 7,
characterised by
further comprising a handle (17,26).

- 15 9. Apparatus according to claim 12,
characterised in that
said handle is at said one open end (16) and comprises
an extension (17) of said first wall (11) in the
longitudinal direction of said container (10).

20

10. Apparatus according to claim 8, wherein said handle
(26) comprises a hook,
characterised in that
said first wall (22) has an aperture (27) therein
25 adjacent said one open end (24) and adapted to receive
said handle (26) therethrough.

30

11. A method of processing flexible sheet material using
a container (10,21) according to any preceding claim,
characterised by
the steps of rolling said sheet into a spiral of
smaller diameter than that of said container (10,21),
inserting said spirally wound sheet into said container
(10,21) through said one open end (16,24), allowing
35 said sheet to unwind so as to conform to the inwardly

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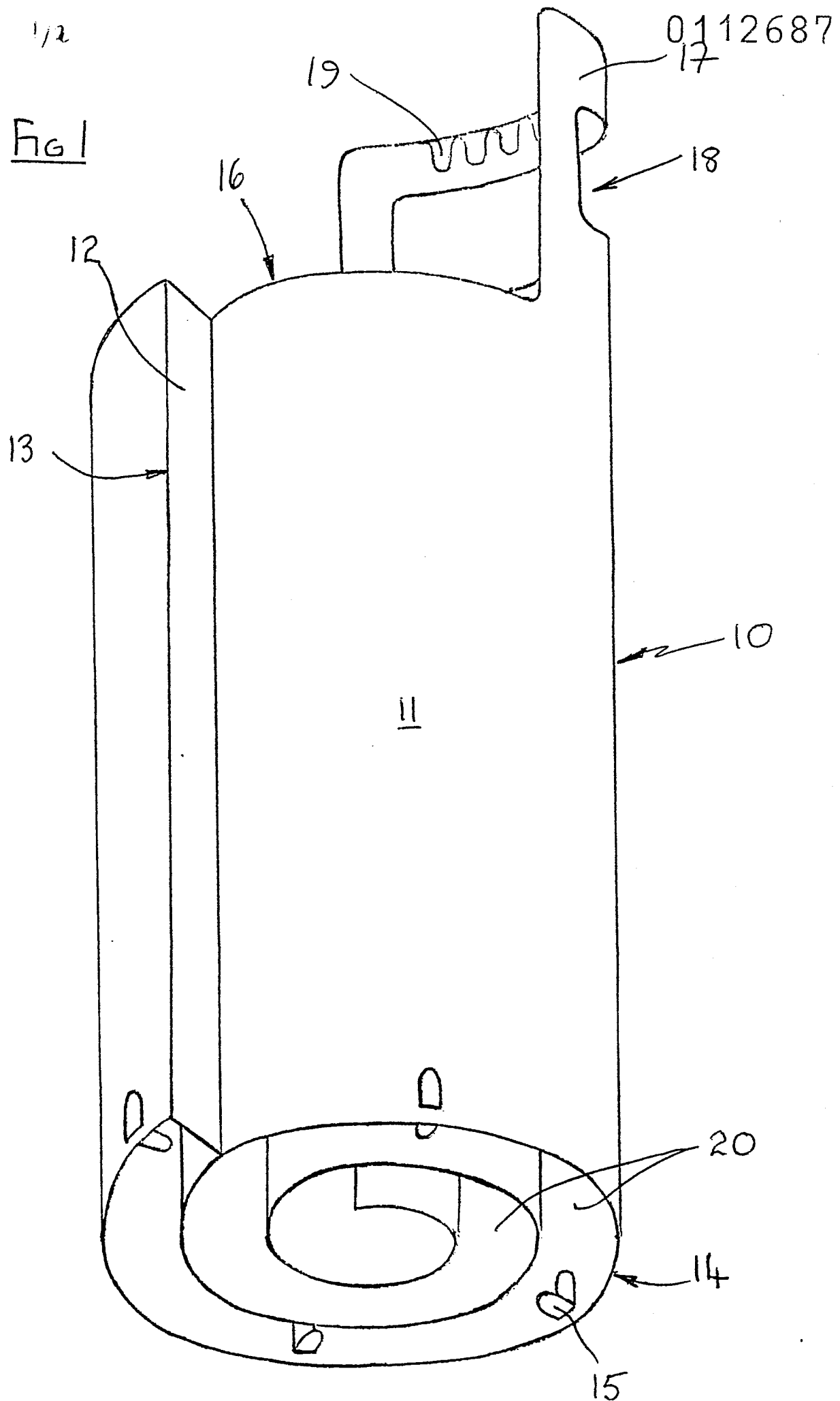
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facing surface (20) of said first wall (11,22) and
subjecting said sheet in said container (10,21) to a
fluid treatment.

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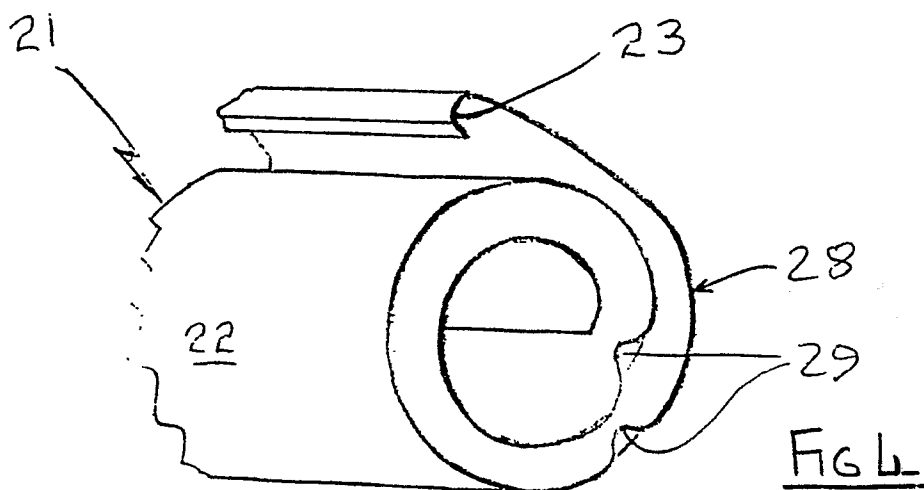
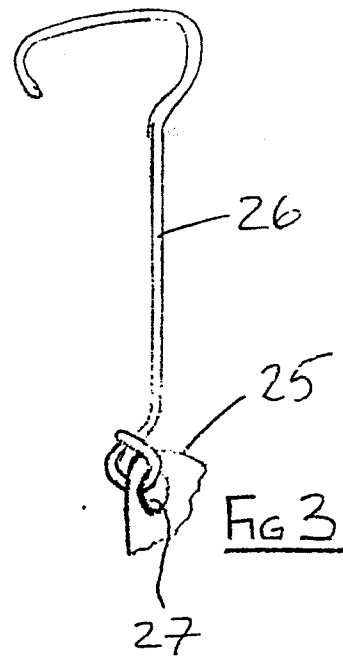
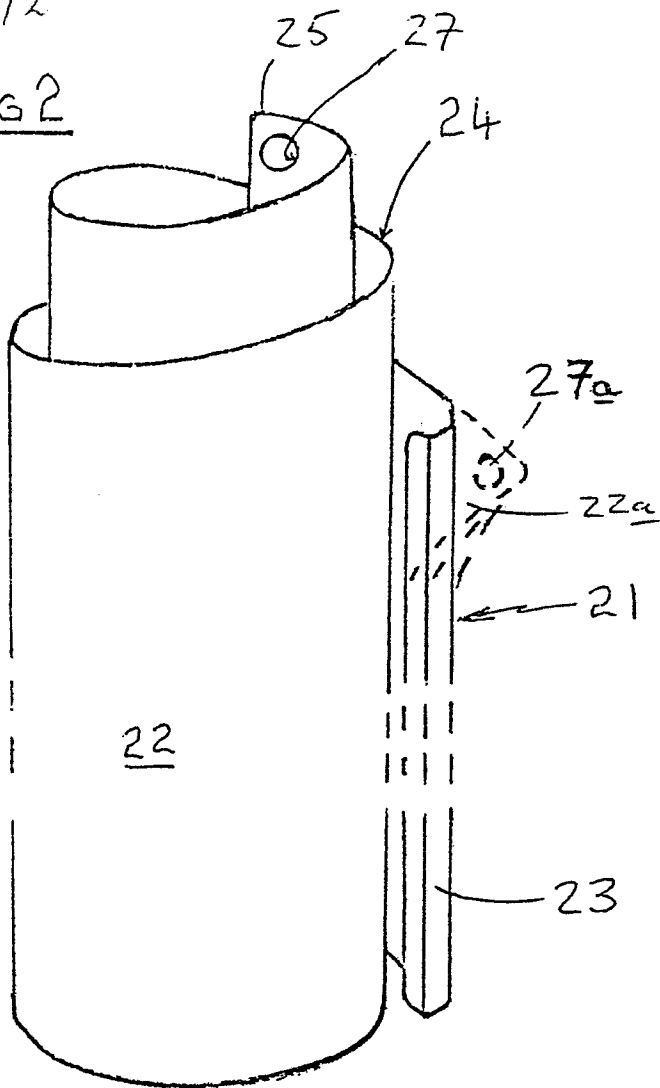
Fig 1



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Fig 2





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EUROPEAN SEARCH REPORT

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Application number

EP 83 30 7605

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
X	FR-A- 470 854 (A.C. GRUET) * Pages 1,2; figures 1-3 * ---	1-3,8,10	G 03 D 13/14
A	US-A-1 346 780 (G.C. BEIDLER) * Pages 1,2; figures 1-3 * ---	1	
A	US-A-2 804 003 (I.F. HOFFMAN) * Columns 2,3; figures 1-3 * ---	1	
A	US-A-4 001 856 (P.B. STIMSON) * Columns 2,3; figures 1-6 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3) G 03 D 13/14 G 03 D 13/04
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22-03-1984	Examiner BOEYKENS J.W.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			