



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 425 746 A1

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 89311848.9

(51) Int. Cl.⁵: A61H 33/02, B05B 1/34

(22) Date of filing: 16.11.89

(30) Priority: 30.10.89 US 428840

(43) Date of publication of application:
08.05.91 Bulletin 91/19

(54) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

(71) Applicant: Mathis, Cleo
16209 Santa Bianca Drive
Hacienda Heights California 91745(US)

(72) Inventor: Mathis, Cleo
16209 Santa Bianca Drive
Hacienda Heights California 91745(US)

(74) Representative: Woodward, John Calvin et al
VENNER SHIPLEY & CO. 368 City Road
London EC1V 2QA(GB)

(54) Fluid jet nozzle structure.

(57) A fluid jet nozzle (134,234) for a whirlpool tub or spa including at least one channeling flange (102) defined within and extending from a tapered side wall (140) of a flow passage through the nozzle (134,234) so as to laminarize flow therethrough. Providing such a jet increases whirlpool action adjacent the fluid pumping system or motor of the spa so as to make whirlpool action uniform substantially peripherally of the spa.

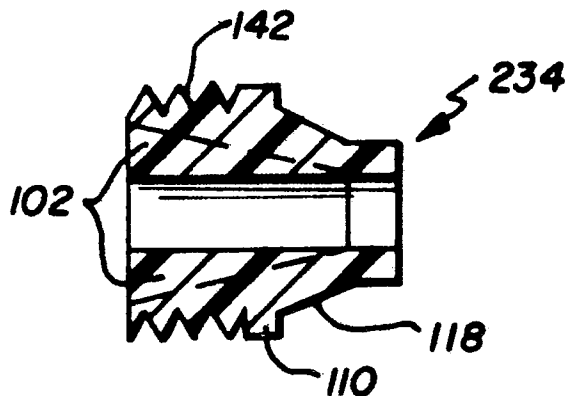


Fig. 18

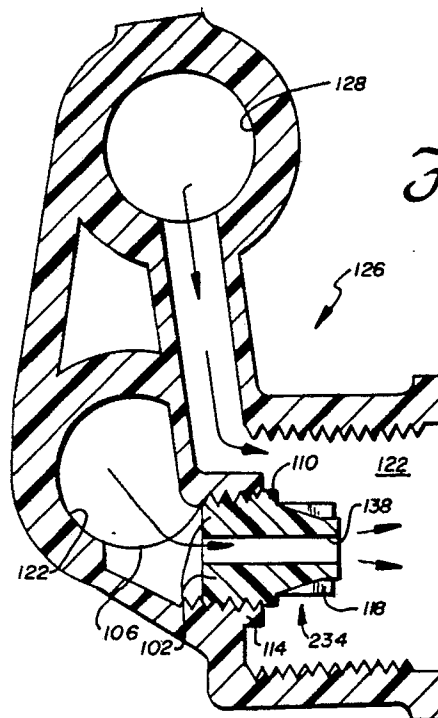


Fig. 20

EP 0 425 746 A1

FLUID JET NOZZLE STRUCTURE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to fluid jet nozzles and, in particular, to a fluid jet nozzle structure for spas and whirlpool baths.

2. Description of the Related Art

A typical whirlpool system is illustrated by way of example in FIG. 1. The whirlpool system includes a motor 12 having a fluid intake 14 and a fluid outlet 16. The fluid intake 14 is coupled by an elongated conduit 18 to a suction opening 20 suitably fluidly coupled to the tub or spa shell surface. (not shown) Water is drawn through the suction opening 20, conduit 18 and fluid intake 14 by the motor 12 and recirculated into the spa through the fluid outlet 16. The outlet 16 is fluidly coupled to conduits 22 which extend along either side of the spa. Thus, a Y-connector or the like 24 is provided adjacent the motor 12 so as to define first and second flow paths into the fluid delivery conduits 22. Fluid jet nozzle housings 26 are provided at spaced locations along each of the fluid delivery conduits 22 (labeled 26a-f in Fig 1). An air flow line is also typically provided in whirlpool systems. The air flow line 28 can be controlled by the spa user (control not shown) so that air flows through an elbow joint 30 and access tube 32 to a peripherally disposed air flow line 28. The air, therefore, can be selectively added to the water flowing through the nozzles in the housings 26 as is well known in the art and described more particularly below with reference to FIGS. 20 and 21.

A conventional fluid jet nozzle 34 is illustrated by way of example in FIGS. 4-6. The illustrated fluid jet nozzle 34 is a substantially tubular element having a proximal fluid inlet 36 and a distal fluid outlet orifice 38. The flow path through the nozzle is tapered as at 40 from a maximum diameter at the proximal, fluid inlet end 36 thereof towards a minimum diameter at the distal end thereof, thereby increasing the flow velocity at the distal outlet orifice 38 to provide whirlpool action. The exterior surface of the nozzle 34 includes screw threads 42 extending axially from the proximal end 36 so that the nozzle can be threadably attached to a jet nozzle housing 26 (shown generally, for example, in FIGS. 20 and 21). Distally of the screw threads, the nozzle 34 is tapered so as to define a reduced

diameter distalmost end. Further, at least first and second flanges 44 are defined on the tapered portion of the nozzle 34. These flanges 44 facilitate gripping the nozzle 34 to unthread the same from the respective nozzle housing and thread it thereto for cleaning, replacement, assembly and the like. As can be seen in FIG. 4, and in the cross-sections of FIG. 5 and FIG. 6, the flow passage through the conventional nozzle is uniformly tapered circumferentially of the flow passage and is, therefore, free from obstruction to flow.

Another conventional fluid jet nozzle 34' is illustrated in the elevational view of FIG. 7. This nozzle is substantially similar to the nozzle of FIGS. 4-6 but further includes a tubular extension element 46 for conducting the fluid flowing from the nozzle orifice to a point remote from that orifice. That configuration, as can be seen, includes flange elements 48 which are somewhat larger than those shown on the nozzle 34 of FIGS. 4-6 to facilitate removal and attachment of the nozzle in spite of the tubular extension 46.

A problem common to whirlpool systems is that not all of the jets about the whirlpool system provide the same "whirlpool action". Indeed, it has been found that the jets disposed closest to the pump such as, for example, jets 26a and 26b shown in FIG. 1 traditionally produce the weakest action while those farthest away from the pump, for example jets 26d and 26f, produce the greatest action. The variation in whirlpool action along a fluid flow line 22 from a pump end 50 to a remote end 52 is schematically illustrated in FIG. 2.

The inventor hypothesized that the variation in the whirlpool action was due to turbulence in the fluid flow lines 22. More particularly, the inventor hypothesized that turbulence is more intense at the end 50 of the fluid flow line 22 closest to the pump outlet 16 and, that as the water travels further along the conduit(s) 22 of the system, the turbulence decreases. The variation in whirlpool action, the inventor surmised was due to the fact that as the turbulent water moves through the pipes past the water pick-up area of the venturi (FIG. 20), it creates a whirling action. This funnel effect which has little axial velocity, continues right on through the standard type orifice unchecked. Thus, the water issuing from the nozzles disposed proximal to the motor, issue fluid having a whirling action as opposed to a high velocity axial trajectory, which is the desired "whirlpool action".

Often whirlpool manufacturers and installers attempt to correct the discrepancy in whirlpool action by, for example, drilling out the orifice of the whirlpool jet nozzle so as to increase fluid flow thereth-

rough in an effort to increase the whirlpool action. Others loop the water lines when possible so that net whirlpool action is uniform peripherally of the spa or tub although the action varies from nozzle to nozzle. These processes are labor intensive and costly. If, on the other hand, nothing is done in an effort to evenly distribute the whirlpool action, a dissatisfactory product results.

It would, therefore, be desirable to provide jet nozzles in a whirlpool-like tub or spa such that the whirlpool action from the nozzles most adjacent the motor, that is at the beginning of a fluid flow line, is substantially the same as that at the end of the fluid flow line.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a jet nozzle structure which laminarizes fluid flowing through the nozzle so that substantially axially directed fluid is emitted from the distal orifice of the nozzle, whereby uniform whirlpool action can be generated through the tub or spa.

In order to achieve the foregoing object, the nozzle of the present invention utilizes channeling flanges inside the orifice structure. The flanges stop the whirling action of the turbulent water as it is being directed through the nozzle before it enters the mixing chamber (FIG. 20). Thus, the channeling flanges create a more solid mass of water flowing through the mixing chamber and out the nozzle orifice, and a greater whirlpool action is derived from the jet nozzle. Such a laminarizing nozzle can be provided at least in nozzle housings provided along the proximal portion of the fluid flow line so that those jets exhibit a more axial fluid trajectory and thus all the jets of the system are more evenly balanced in water flow and force.

Other objects, features, and characteristics of the present invention as well as the methods of operation and functions of the related elements of structure, and the combination of parts and economies of manufacture, will become more apparent upon consideration of the following description and the appended claims with reference to the accompanying drawings, all of which form a part of this specification, wherein like reference numerals designate corresponding parts in the various figures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of a typical whirlpool jet system in which the nozzle of the invention may be provided;

FIGURE 2 is a schematic elevational view showing whirlpool action from conventional nozzles provided at spaced locations along a water jet system fluid flow conduit;

FIGURE 3 is a schematic elevational view of whirlpool jet action resulting from the use of least one nozzle provided in accordance with the present invention;

FIGURE 4 is a proximal end view of a conventional nozzle;

FIGURE 5 is a cross-sectional view of a conventional nozzle taken along line 5-5 of FIG. 4;

FIGURE 6 is a cross-sectional view of a conventional nozzle taken along line 6-6 of FIG. 4;

FIGURE 7 is an elevational view of another conventional fluid jet nozzle;

FIGURE 8 is a view of the proximal end of a nozzle provided in accordance with the present invention;

FIGURE 9 is a cross-sectional view of a nozzle provided in accordance with the present invention taken along line 9-9 of FIG. 8;

FIGURE 10 is a cross-sectional view of a nozzle provided in accordance with the present invention taken along line 10-10 of FIG. 8;

FIGURE 11 is a view of the distal end of the nozzle of FIGS. 8-10;

FIGURE 12 is an elevational view of an alternate nozzle provided in accordance with the present invention;

FIGURE 13 is an end view taken along line 13-13 of FIG. 12;

FIGURE 14 is an end view taken along line 14-14 of FIG. 12;

FIGURE 15 is an elevational view of yet another nozzle provided in accordance with the present invention;

FIGURE 16 is an end view taken along line 16-16 of FIG. 15;

FIGURE 17 is an end view taken along line 17-17 of FIG. 15;

FIGURE 18 is a cross-sectional view taken along line 18-18 of FIG. 16;

FIGURE 19 is a cross-sectional view taken along line 19-19 of FIG. 17;

FIGURE 20 is a cross-sectional view of a nozzle housing with the nozzle of FIG. 15 mounted thereto; and

FIGURE 21 is a view of the distal outlet of the nozzle housing of FIG. 20.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EXEMPLARY EMBODIMENTS

The jet nozzle 134 provided in accordance with the present invention includes at least one and preferably two diametrically opposed channelling

flanges 102 defined within the tapered portion 140 of the flow passage defined therethrough. A gap 104 is defined between the channelling flanges 102 which substantially corresponds to the diameter of the distal orifice 138 of the jet nozzle. Thus, the flanges 102 themselves decrease from a maximum radial height adjacent the proximal end 136 of the nozzle to a minimum radial height adjacent the distal orifice 138. As water moves through the conduits 122 past the water pick-up area 106 of the venturi, the flanges 102 block the whirling action and channel the fluid flow through the tapered portion 140 to the distal orifice 138 of the nozzle 134 (FIG. 20). Thus, the flanges 102 laminarize the flow through the nozzle 134 and increase the trajectory of the fluid out of the distal orifice 138.

As can be seen in the embodiments of FIGS. 7-11 and 12-14, the nozzle 134 of the invention can have an exterior configuration substantially similar to that of the conventional nozzle illustrated in FIGS. 4-7 and discussed above with reference thereto. Such corresponding structures are labeled in a manner corresponding to FIGS. 4-7 but preceded by a "1".

In this regard, it is noteworthy that while screw threads have been illustrated as a means for coupling the nozzle 134 to the housing 126, any suitable coupling means such as a luer-type connecting structure or bayonet coupling could be provided.

As a further alternative to the exterior configuration of the prior art nozzle, a flange 110 can be defined at the distal edge of the screw threads 142 as shown, in particular, in FIGS. 15 and 17-21. When the nozzle 234 of FIG. 15, then, is threadably coupled to the nozzle housing 126, contact of the flange 110 with the distal end of the nozzle receiving portion 114 of the housing prevents further insertion of the nozzle 234 into the nozzle housing 126 and thus ensures that the nozzle is properly disposed with respect thereto. Indeed, such a flange 110 not only prevents over insertion, but provides a reliable indication that the nozzle has been fully inserted. Thus, even when the nozzle is coupled to the housing when the spa, for example, has been previously filled with fluid, proper attachment of the nozzle without viewing the same is possible.

Ears 116 can also be provided which extend radially from the flange 110 as shown, in particular, in FIGS. 17, 19 and 21. The ears 116 further insure proper insertion of the nozzle and facilitate manual manipulation of the nozzle on insertion and removal. Indeed, the ears can be manually grasped and utilized to rotate the nozzle on preliminary insertion and final removal and the attachment flanges 144 can be simply used for final tightening and initial loosening of the nozzle.

As is apparent from the foregoing, while in the preferred embodiment first and second channeling flanges 102 are provided, a single flange would contribute laminarization of the flow, although the laminarization may not be as effective. Therefore, such a configuration is deemed to be within the scope of the invention. Likewise, the nozzle of the present invention may be provided in one or more of the jet housings provided along the fluid flow conduit of a whirlpool system, as illustrated, for example, in FIG. 1. Most preferably, the nozzle of the invention is provided in the whirlpool jet housings defined in the proximal portion of the flow line, adjacent the motor. The amount and location of attenuated whirlpool action, however, would determine those points along the fluid flow line where the nozzle of the invention can be most advantageously employed. The nozzle of the invention could, of course, be utilized in whirlpool systems other than that schematically depicted in FIG. 1 and provided in housings other than that schematically shown in FIG. 20. Indeed, the nozzle structure of the invention and, in particular, the channeling flanges could be defined within the tapered portion of any nozzle provided in a fluid flow line wherein turbulent flow attenuates whirlpool action at a proximal end of the flow line. As schematically shown in FIG. 3, then, the appropriate provision of nozzles in accordance will alter the whirlpool action provided by conventional nozzles (FIG. 2) to provide a more uniform whirlpool action along the entire fluid flow line.

While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiment, but on the contrary is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

For example, while attaching flanges 144 have been illustrated for facilitating threading attachment of the nozzle 134, 234 to the nozzle housing 126 and removal of the same, other means for assisting such attachment and removal could be provided. For example, flattened surfaces could be provided on diametrically opposed sides of the distal end of the nozzle for manually grasping the same or for engagement with a wrench or the like device for tightening or loosening the nozzle. Likewise, while the nozzle has been depicted as having a tapering forward end 118 to, in particular, provide a smooth transition with air inflowing from the air flow line 128 and mixing within the mixing chamber 122, other exterior configurations could be provided without departing from the invention.

Furthermore, the channeling flanges 102 provided in accordance with the present invention

need not be defined in a plane offset by 90° relative to the external flanges 144, as shown in FIGS. 8-21. Indeed, the functions of these two portions of the nozzle are not dependent upon one another. Thus flanges 102 and 144 may be defined in the same plane or in planes offset by any amount.

Even further, the nozzle provided in accordance with the present invention can be formed from any suitable material such as, for example, a polymer, such as polyvinyl chloride (PVC), a metal material, etc. Therefore, the cross hatching utilized in the drawing figures is not intended to be limiting but merely exemplary.

Claims

1. A fluid jet nozzle comprising:

a nozzle element having a proximal end and a distal end, a longitudinal axis, and a fluid flow passage defined therethrough along said longitudinal axis, said fluid flow passage tapering from a first relatively large cross-section adjacent said proximal end to a relatively small cross-section adjacent said distal end;

means for coupling said nozzle element to a nozzle housing; and

at least one channeling flange element defined within said tapered portion of said fluid flow passage, said at least one flange extending radially inwardly from a wall of said tapered portion and extending axially along at least a portion of the length of said tapered portion of said flow passage, whereby at least a portion of the fluid flowing through said tapered portion is laminarized.

2. A fluid jet nozzle as in claim 1, wherein said means for coupling comprise screw threads defined along at least a portion of the exterior surface of said nozzle element.

3. A fluid jet nozzle as in claim 2, wherein said screw threads are defined along a proximal end portion of said nozzle element.

4. A fluid jet nozzle as in claim 1, wherein two channeling flanges are defined in said tapered portion.

5. A fluid jet nozzle as in claim 4, wherein said channeling flanges are diametrically opposed to one another so as to be defined in a single plane.

6. A fluid jet nozzle as in claim 1, further comprising first and second exterior flange elements extending axially along at least a portion of the exterior surface of said nozzle element, said exterior flange elements being diametrically opposed to one another.

7. A fluid jet nozzle as in claim 6, wherein two channeling flanges are defined in said tapered portion.

8. A fluid jet nozzle as in claim 7, wherein said channeling flanges are diametrically opposed to one another so as to be defined in a single plane.

9. A fluid jet nozzle as in claim 8, wherein said channeling flanges are defined in a plane which is offset by 90° with respect a plane of said exterior flanges.

10. A fluid jet nozzle as in claim 1, further including an extension tube element mounted to and extending distally from said distal end of said nozzle element to define an outlet orifice remote from said distal end of said nozzle element.

11. A fluid jet nozzle as in claim 1, wherein said nozzle element has a circular exterior cross-section.

12. A fluid jet nozzle as in claim 11, wherein said circular exterior cross-section varies in diameter along at least a portion of the length of said nozzle element.

13. A fluid jet nozzle as in claim 12, wherein a portion of the exterior surface of said nozzle element tapers to a minimum diameter adjacent said distal end.

14. A fluid jet nozzle as in claim 2, wherein a circumferential flange element is defined at a distal end of said screw threads.

15. A fluid jet nozzle as in claim 2, wherein said nozzle element has a circular exterior cross-section, a portion of the exterior surface of said nozzle element tapers to a minimum diameter adjacent said distal end, and a circumferential flange element is defined at a distal end of said screw threads and proximally of said tapered exterior surface.

16. A fluid jet nozzle as in claim 14, further comprising first and second diametrically opposed ear elements extending radially from said circumferential flange.

17. A fluid jet nozzle as in claim 15, further comprising first and second diametrically opposed ear elements extending radially from said circumferential flange.

18. A fluid flow system comprising:

at least one fluid flow conduit;

means for pumping fluid through said at least one fluid flow conduit fluidly coupled thereto; and

a plurality of fluid jet nozzle elements mounted along the length of each said fluid flow conduit and fluidly coupled thereto, at least one of said fluid jet nozzle elements having a proximal end and a distal end, a longitudinal axis, and a fluid flow passage defined therethrough along said longitudinal axis, said fluid flow passage tapering from a first relatively large cross-section adjacent said proximal end to a relatively small cross-section adjacent said distal end, and at least one channeling flange element defined within said tapered portion of said fluid flow passage, said at least one flange extend-

ing radially inwardly from a wall of said tapered portion and extending axially along at least a portion of the length of said tapered portion of said flow passage;

whereby at least a portion of the fluid flowing through said tapered portion is laminarized. 5

19. A fluid flow system as in claim 18, further comprising at least one fluid jet nozzle housing, each said fluid jet nozzle element including means for coupling said nozzle element to a said nozzle housing. 10

20. A fluid flow system as in claim 18, wherein one of said at least one nozzle elements is disposed at a proximal end of each said fluid flow conduit with respect to said pump means. 15

20

25

30

35

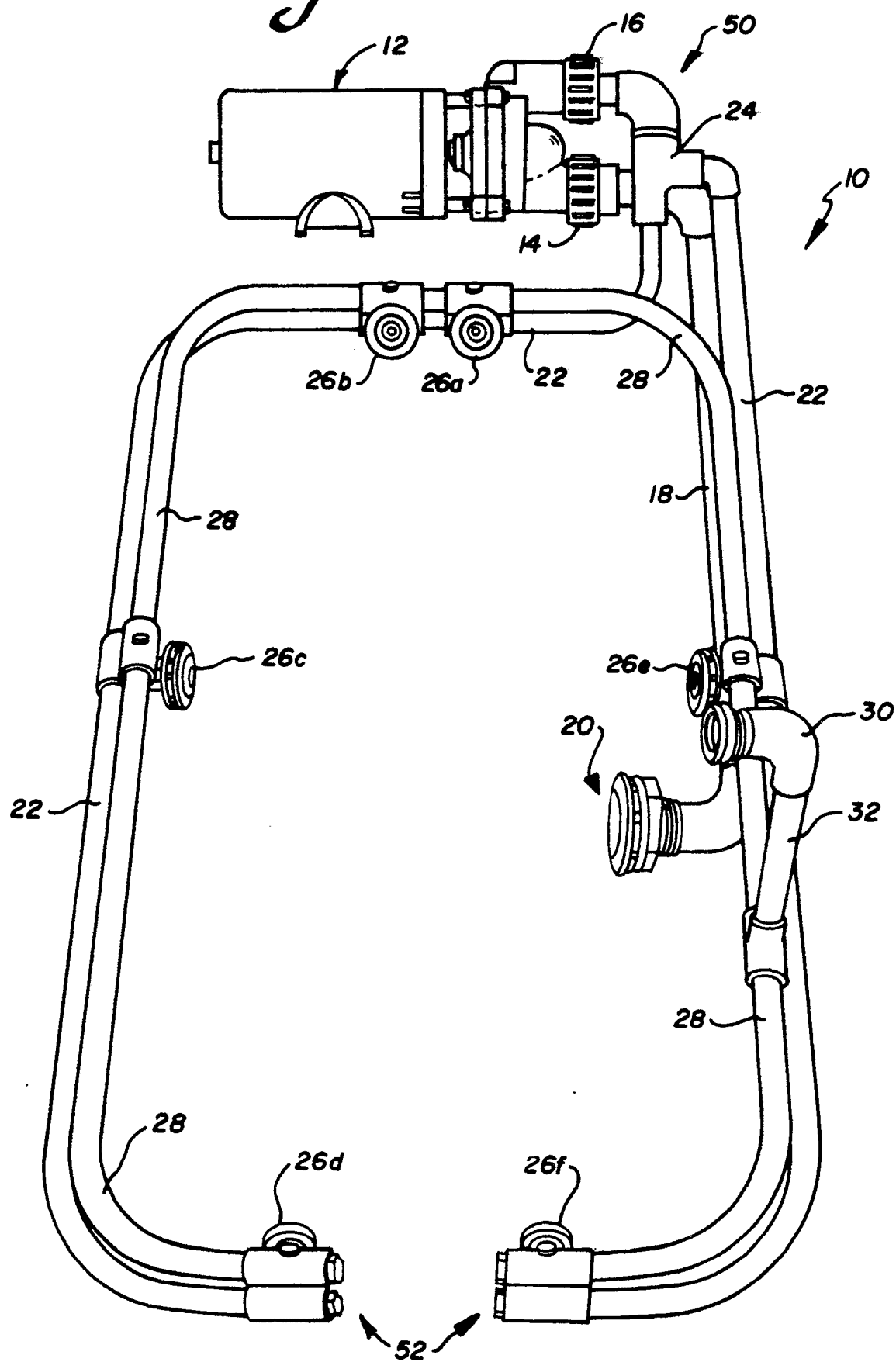
40

45

50

55

Fig. 1



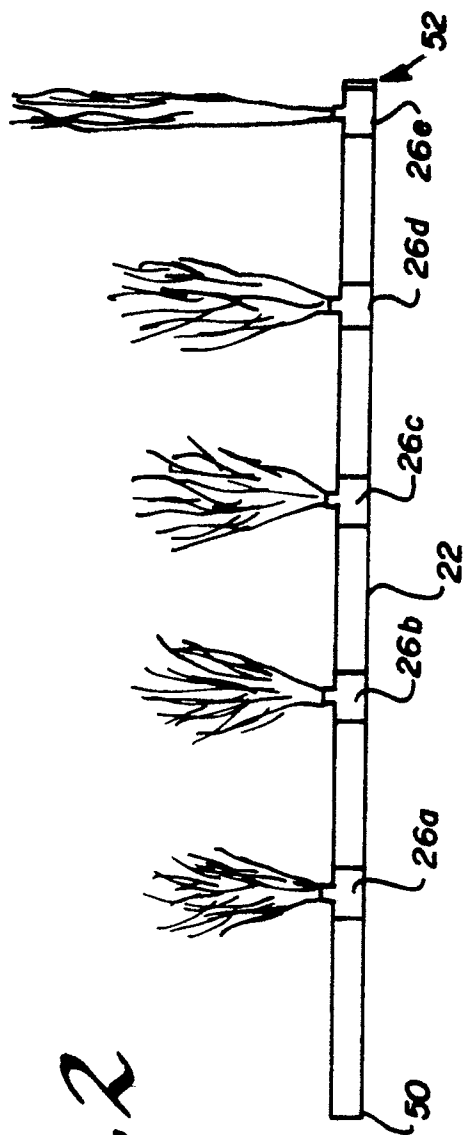


Fig. 2

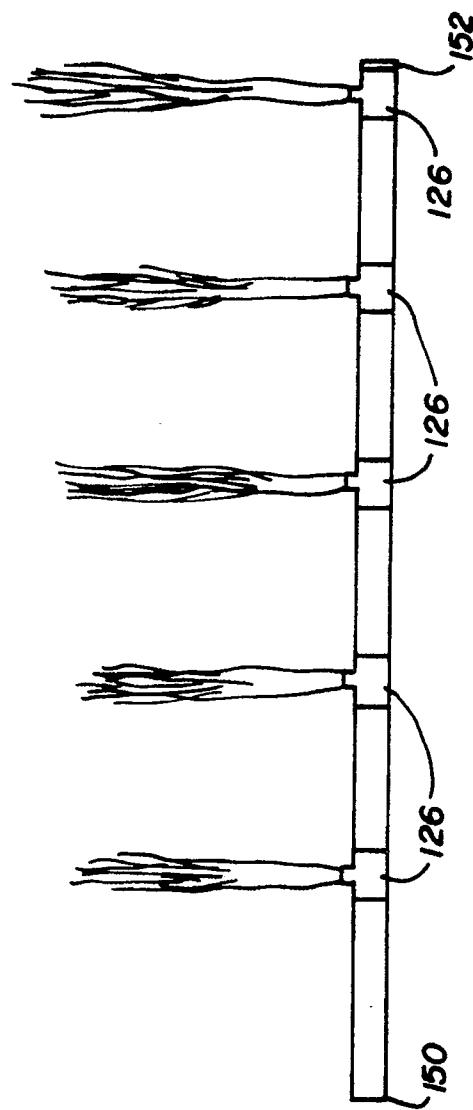


Fig. 3

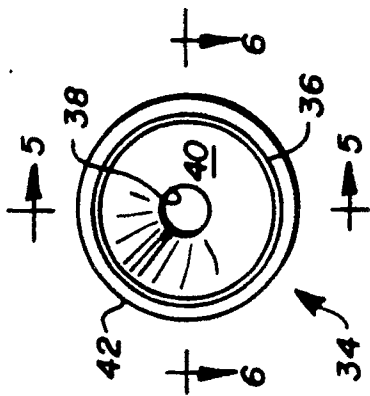


Fig. 4

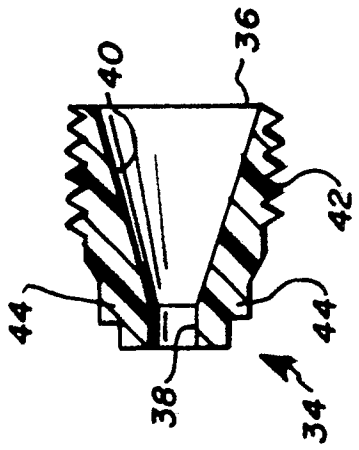


Fig. 5

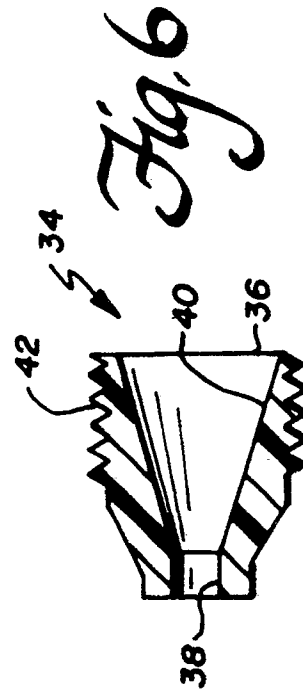


Fig. 6

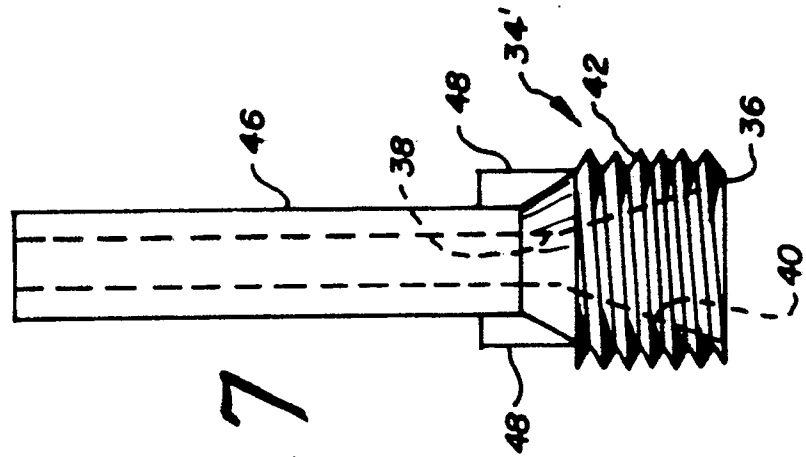


Fig. 7

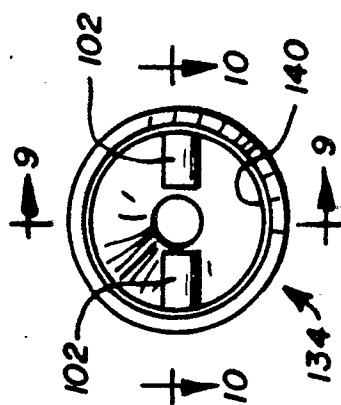


Fig. 8

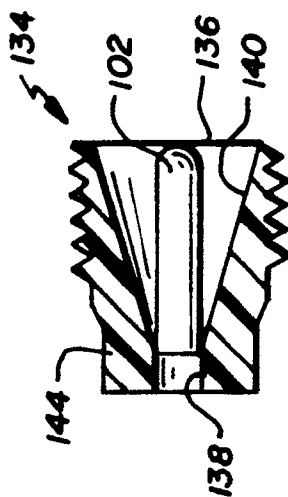


Fig. 9

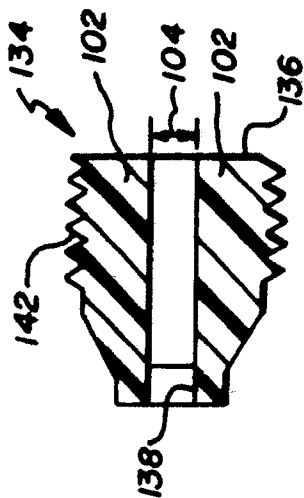


Fig. 10

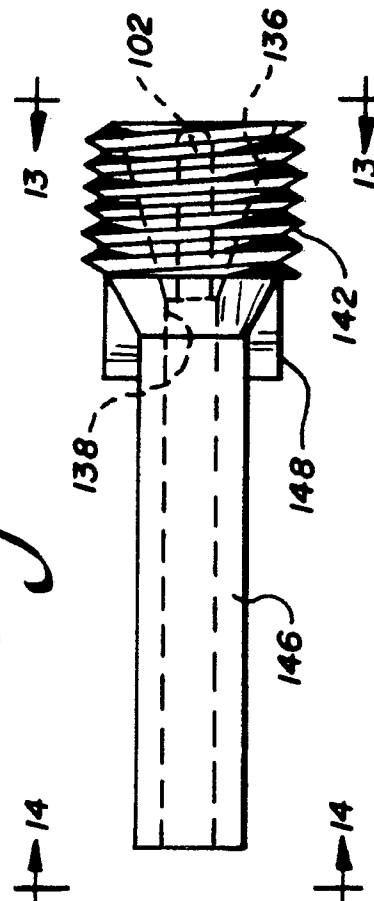


Fig. 12

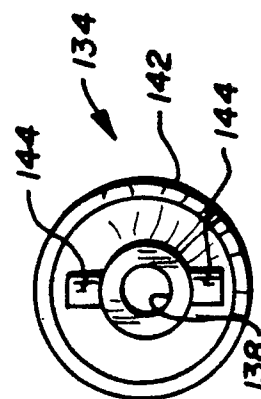


Fig. 11

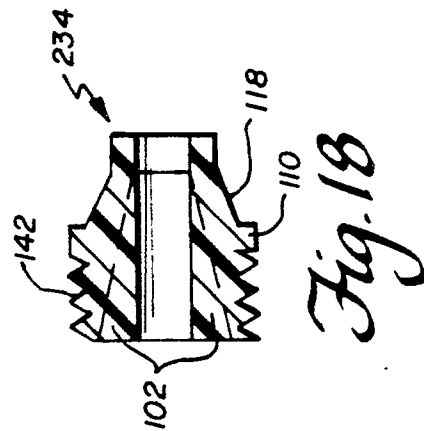
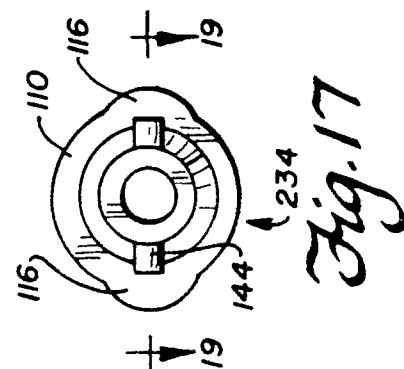
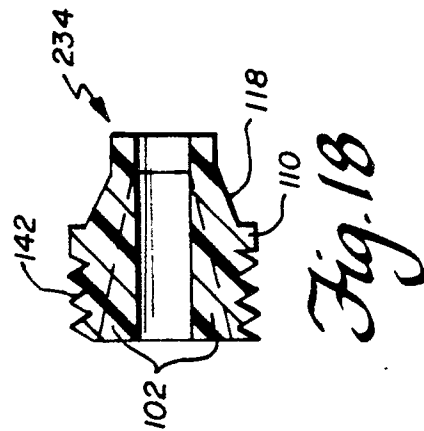
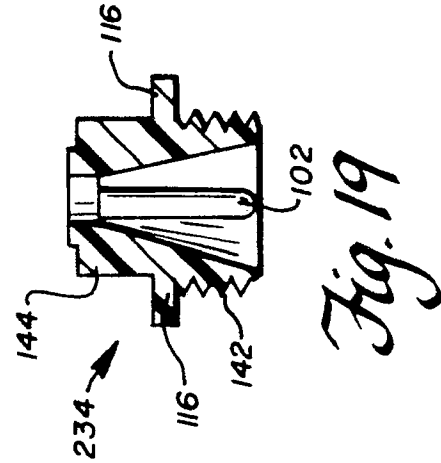
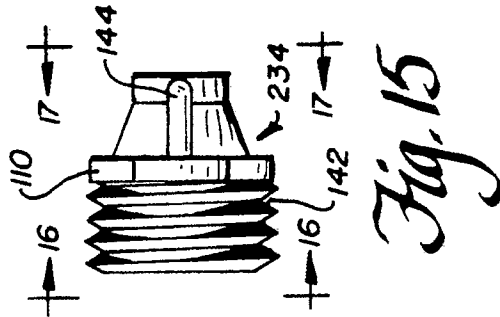
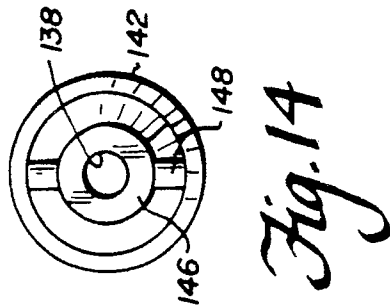
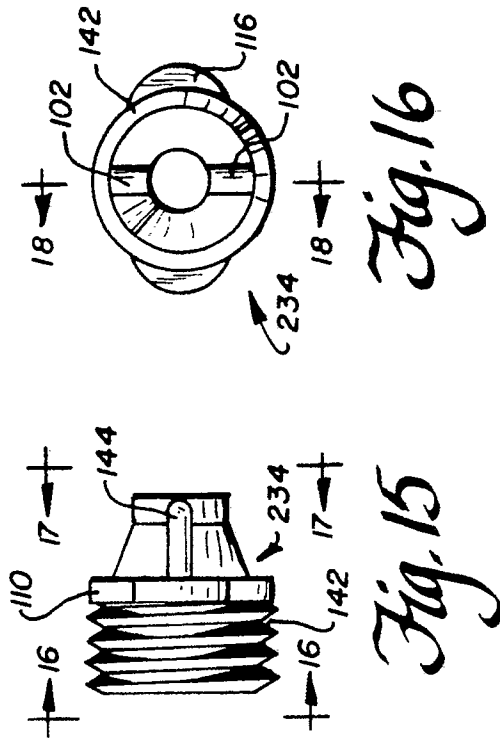


Fig. 20

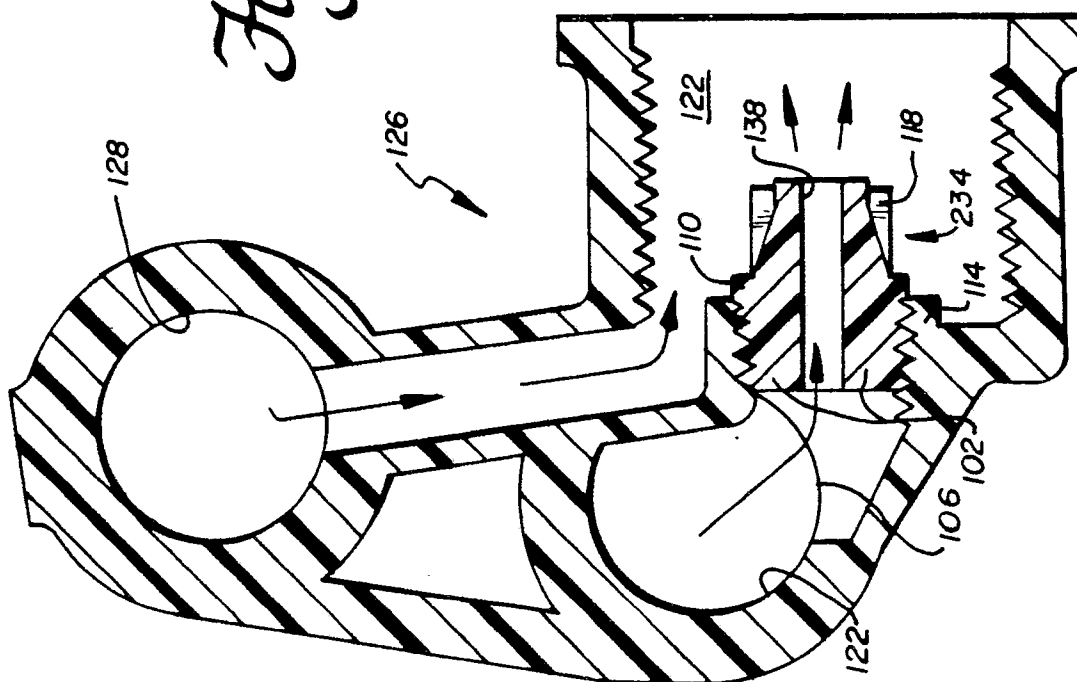
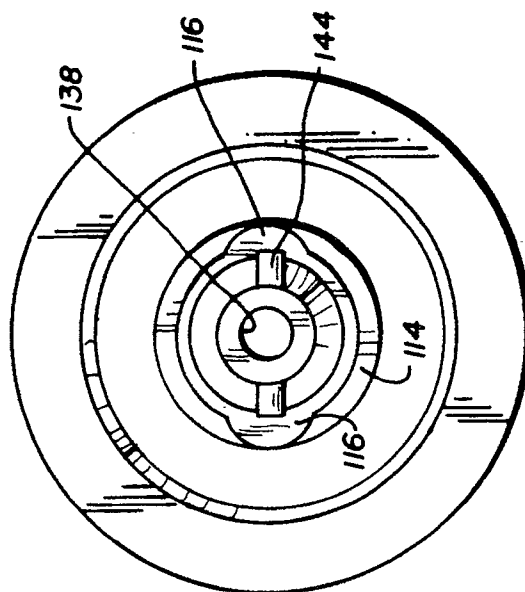


Fig. 21





European
Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 31 1848

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.5)
X	US-A-4 449 669 (MEHOUDAR) * Column 2, lines 30-46; column 3, lines 5-8; figures 1,3,5 * - - - -	1,11,12	A 61 H 33/02 B 05 B 1/34
Y		2-6,10, 13-15, 18-20	
Y	GB-A-2 010 107 (SOUTH PACIFIC INDUSTRIES) * Page 1, line 120 - page 2, line 15; page 4, lines 6-35; figures 1,6,7 * - - - -	2,3, 13-15, 18-20	
Y	GB-A-1 401 4 (MORRIS) * Page 1, line 35 - page 2, line 5; page 2, lines 19-21; figures 2,6 * - - - -	4,5	
A		7,8	
Y	US-A-3 946 449 (MATHIS) * Column 3, line 65 - column 4, line 9; column 4, line 55 - column 5, line 3; figures 3,7 * - - - -	6,10	
A		16,17	
A	GB-A-1 254 21 (HUMPHREY) * Page 2, lines 3-11; page 2, lines 24-39; figure 1 * - - - -	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	CH-A-2 635 98 (FABRIKEN PLASTICA) * Page 1, lines 34-45; figures 1,2 * - - - - -	1	A 61 H B 05 B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of search 24 January 91	Examiner SCHOENLEBEN J.E.F.
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			