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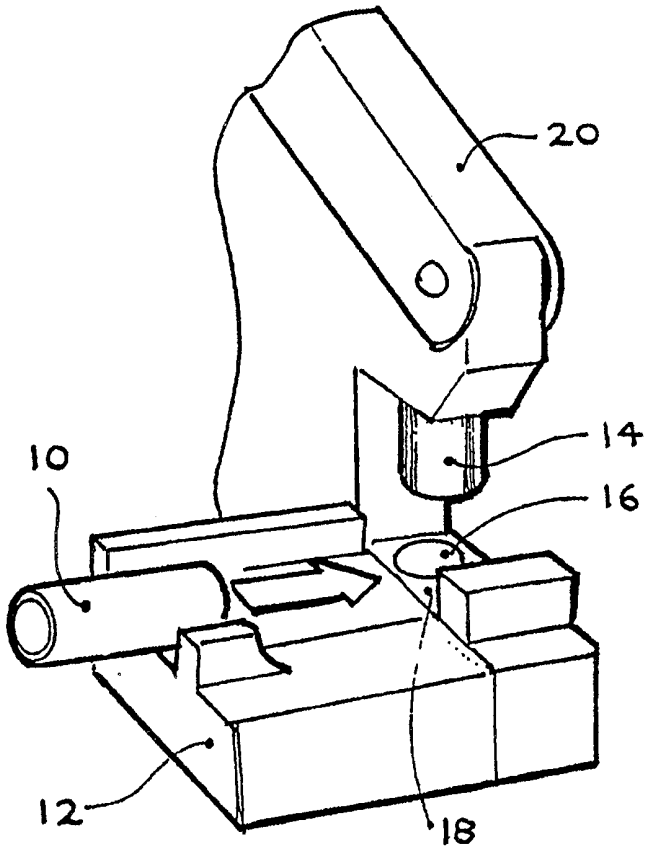
(54) Title: CONSTRUCTIONAL TOY AND APPARATUS FOR MAKING SAME

(57) Abstract

A constructional model comprises a multiplicity of straws, wherein at least some straws are joined together with a first straw extending through a second straw via a pair of transversely aligned holes in the second straw, each of said holes being surrounded by portions of the second straw and the first straw fitting tightly within the holes in the second straw. In a preferred feature at least some straws are joined longitudinally together by an end of one straw extending tightly into an enlarged socket end of another straw. The invention also provides a device for punching transverse holes in a straw comprising a punch (14) and die (16), and support means (18) to either side of the punch and die for supporting flattened surrounding regions of the straw during formation of the holes.



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CONSTRUCTIONAL TOY AND APPARATUS FOR MAKING SAME

The present invention relates to a constructional toy or model comprising a multiplicity of straws joined together, to a method of making the toy or model and to a constructional system or kit for making models out of straws. It further provides a device for punching transverse holes in a straw.

A construction system for making models out of straws has previously been sold under the trade name Construct-O-Straws. It comprised a set of plastics straws and plastics joining parts formed with spigots which fitted endwise into the straws to form junctions between them. The joining parts might have two spigots for forming a linear or corner junction, three spigots for forming a T-junction or four or more spigots for forming more complex junctions. However, the corner parts were noticeable and restricted the appearance of the models made and the range of models that could be made. Furthermore, if a user ran out of joining parts, or of parts of a particular kind, he then had to stop or to purchase an additional kit.

One problem with which the invention is concerned is to provide a constructional toy based on assembling straws together, in which the user is not liable to run out of necessary parts for model making.

Another problem with which the invention is concerned is to provide constructional toys or models based on straws in which the whole of a complex model may, if the user so wishes, be formed from the straws.

A further problem with which the invention is concerned is to provide simple and effective apparatus for use in making toys or models as aforesaid.

In one aspect the invention provides a model comprising a multiplicity of straws, wherein at least some straws are joined together with a first straw extending through a second straw via a pair of transversely aligned holes in the second straw, each of said holes being surrounded by portions of the second straw and the first straw fitting tightly within the holes in the second straw.

In a further aspect the invention provides a method for making a toy or model by joining straws together, comprising the steps of:

punching a first straw with a punch having substantially the same external diameter as the straw so that the first straw becomes flattened and a pair of transversely aligned holes are formed which are separated by undamaged regions of the straw;

allowing the straw to recover its shape; and

passing a second straw through the pair of holes in the first straw to form a joint in which there is frictional resistance to axial and angular relative movement between the first and second straws.

In a yet further aspect the invention provides a device for punching transverse holes in a straw comprising a punch and die, and support means to either side of the punch and die for supporting flattened surrounding regions of the straw during formation of the holes.

In a yet further aspect the invention provides a method for forming holes in a straw using a punch and die device as aforesaid.

The invention also provides a set of tools for making models out of straws, including a punch for punching pairs of transversely aligned holes through the straws, a cutter for cutting the straws to length and an expander for expanding

ends of straws into receiving sockets.

Other preferred aspects of the invention are defined in the accompanying claims to which attention is hereby directed.

How the invention may be put into effect will now be described with reference to the accomapnying drawings in which:

Fig. 1 is a diagrammatic perspective view of a punch unit for forming pairs of transverse holes in a straw;

Fig. 2a and Fig. 2b are diagrammatic end views of the punch of Fig 1 showing successive stages in the cutting of transverse holes in a straw;

Fig. 3a and Fig. 3b are respectively a side and plan view of a straw in which holes have been cut using the punch unit of Fig. 1;

Fig. 4 is a perspective view of a length and angle guide for use with a punch as shown in Fig. 1 and with a movable shuttle for longitudinal and angular positioning of a straw in which holes are to be cut, Fig. 5 is a perspective view of a punch tool which can be hand held or used with the length and angle guide of Fig. 4, Fig. 6 is a transverse section of the shuttle and of the length and angle guide and Fig. 7 is a view of the punch, part of the length and angle guide and part of the shuttle during punching of the first hole in a straw;

Fig. 8 is a view of punched straws and other toy or model components being assembled together;

Fig. 9 is a perspective view of a cutting tool and part of an associated length

guide, and Fig 10 is a view of the cutting tool separated from the length guide and in use for hand cutting of straws;

Fig. 11 is a side perspective view of a straw end stretching tool about to be inserted into an end of a straw, Fig. 12 is a front perspective view of the stretching tool partly inserted into an end of the straw and Fig. 13 is a front view of jaws of the stretching tool after they have been forced apart to stretch the straw;

Fig. 14 is a front perspective view of a multi-function straw cutting, punching and expanding machine, Fig. 15 is a rear view of the machine and Fig. 16 is a detail view in the vicinity of the shuttle of the machine;

Figs 17(1)-17(6) are instructions for making a model swing from "bendy-straws" which can be made simply by punching the straws, cutting them to length and fastening them together using an assembly tool; and

Figs 18(1)-18(10) are instructions for making a model car from "bendy straws" involving the expansion of the ends of some of the components and the joining of them emd-to-end.

The straws which are useful for making the present construction toys are plastics straws, preferably "bendy straws" (i.e. straws which incorporate a corrugated bendable region) and preferably made of polypropylene. Suitable straws of 5 mm external diameter are available from Unique Industries Inc of Philadelphia, USA and from Amscan Inc, also of the USA. For a limited range of models in which strength is less important and end to end tube joins are not needed, paper straws could be used instead.

Fig 1 shows a polypropylene straw 10 of 5mm external diameter supported between the walls of entry guide 12, which have a similar spacing to the external diameter of the tube 10, and passing towards a punch 14 and a die 16. A flat support region or throat 18surrounds the die 16 and is 7.8mm wide which is sufficient to allow a region of the tube adjacent the die 18 to become flattened during the punching operation. As handle 20 is depressed the punch 14 which is of 5 mm external diameter contacts the straw as shown in Fig 2a and then travels down and crushes the straw flat up to the full width of the throat, after which the punch 14 bursts through the straw 10 and ejects two 5mm diameter discs 19 into the barrel of the die as shown in Fig 2b. The handle 20 is released and spring-returns, permitting the straw to recover its circular shape. As seen in Figs 3a and 3b, there is formed a pair of transversely opposed holes 22 in the straw 10 which are separated by un-cut regions of the straw and are closed. The holes 22 assume an elliptical shape in side view and provide the necessary frictional grip on a straw passed through them so that there is formed a joint which may be "posed" in the sense that the axial and angular positions of the joined components can be retained. We have found that the size of the hole punched through the straw is important to forming the desired poseable joint with another straw of the same size, and that the best size for the hole cut is equal to the external diameter of the straw. With the present size of straw, the range of tolerance is about ± 0.1 mm. If the hole size is too small, then it is difficult to push another straw through, and if it is too large, the friction grip of the resulting joint is too low for model making.

Figs 4-6 show in more detail a practical arrangement for the punch. The punch 14, die 16 and operating handle 20 are formed as a separate unit 25 which is a removable fit onto a length and angle guide 27. At one end of the guide 27 there is formed an entry guide region 12a which leads to a recess 28 within which

the punch unit 25 is removably retainable e.g. by a ball catch 30 which snaps into a recess (not shown) in the unit 25. At the outlet side of the recess 28 an elongate bed 31 is formed a T-shaped slideway 32 along which is formed a distance scale or rule 34. A shuttle 36 fits into and is movable along the slideway 32, its longitudinal position being indicated by a pointer 38. Within the shuttle 36 is a barrel 39 which is supported for bi-directional rotation as indicated by arrows 40 and which carries a post or handle 42. A straw 10 with a first pair of the transverse holes 22 punched in it may be pushed onto the post 42 which fits into the holes. In this way the longitudinal and angular position of the straw may be defined and may be maintained during the punching of one or more further pairs of holes through the straw. The slideway 32 is formed with recesses at regularly spaced intervals along its length and the outer surface of the barrel 39 is also formed with recesses 43 which are engageable by a double duty ball indent 40 for indexing length and angle. In the embodiment shown, angle is in 45 degree steps, but other intervals are possible. After the post has engaged into the holes 22, it may be rotated through two indexed steps, for example, to bring it to the position shown in phantom and to permit a second pair of holes at a different position along the straw to be punched at right angles to the first pair of holes.

The cutting of the first end hole using a second form of the shuttle assembly is shown in Fig 7, the form of the shuttle being generally as shown in Fig 16. . The shuttle 36a is moved along the slideway 32a so as to bring the pointer 38a into register with a minimum distance mark 45. The end of the shuttle 36a nearer the punch has on its rotatable barrel part 39a a rearwardly facing lug 46 which is located at its top in the position shown. A downwardly facing through-hole is formed in the lug 46, into which is insertable a pin 50 whose diameter equals the external diameter of a straw. In order to form a first pair of holes, the straw 10 is engaged into the entry guide 12a and advanced until it contacts the pin 50. The

handle 20 is then depressed to punch the first hole pair. The pin 50 is then removed, the first pair of holes 22a is brought into register with the hole in the flange 46, and the pin is returned and engaged into the holes 22a. The pin 50 then provides location for the straw 10, so that the distance to the next desired hole can be measured by sliding the shuttle along the distance scale or length guide 34a and reqding off the required distance. Holes at the same angular positions or at other angular positions (e.g. 45 or 90 degrees apart) can be created by rotation of the barrel 39a. In order to facilitate obtaining of accurate results by a child user, the ball indent provides longitudinal and angular indexing as previously discussed.

Methods of assembling straws together are shown in Fig 8. A rod-like solid plastics assembly tool 60 is slid into a pre-punched straw 62, after which a second pre-punched straw 64 may be pushed onto the first straw 62 to establish the joint, and the assembly tool 60 can be withdrawn. The assembly tool 60 provided the necessary rigidity to the straw 62 during assembly, speeds up assembly of the joint and makes assembly easier for people of limited dexterity. Also shown in Fig 8 is an accessory, in this case a wheel 66 which is free to rotate on a pin 68 which is a push fit into an open end of a straw 70. The pin 68 can be used for mounting other accessories e.g. aeroplane propellers.

A requirement in model-making is to cut the straws to length. For this purpose a guillotine-type cutter may be provided 80 (Figs. 9 and 10) may be provided and may be used alone or in position with a length measuring device 82 which fits onto the cutter when required.

The range of models which can be made is expanded if a facility is provided for joining the straws end-to-end, and this is advantageously by socketed joints e.g. the joint 72 of Fig 8. To form a socket, an expander device 80 is provided which has a pair of jaws 82 of semi-circular profile pivoted together at 84 and controlled by handles 86 biassed apart by a spring 88. The jaws 82 are inserted into the open end of a straw 89, after which the handles 86 are moved together by gentle and gradual finger pressure to move the jaws to the position of Fig. 13 where their largest dimension when viewed in front profile is 5.8 mm. Polypropylene exhibits a thixotropic-type behaviour in the sense that an abrupt movement apart of the jaws is likely to burst the socket as it is formed, whereas a more gradual movement will permit the polypropylene to deform and assume a new shape.

For some modelling kits it may be desirable to provide a tool 90 which combines the functions of a punch, cutter and stretching device. For this purpose, a base 91 is provided which has three parallel inlet guides. A first inlet guide 92 leads to the hole punch, a second inlet guide 94 leads to the cutter and a third inlet guide 96 leads to an expander device. The three guides 92, 94 and 96 are of concave semi-circular shape and are directed parallel to one another. In alignment with the guide 92 there is formed a slideway 98 for a shuttle 38a and associated distance scale 34a. A support channel 100 extends along the base parallel to the slideway 98 for supporting cut portions of straw. The length measuring facility of the shuttle 38a is common to the punching and cutting operations and for this purpose the shuttle 38a has a lateral extension or 'wing' which extends across the channel 100 and provides an abutment for positioning a straw in the channels 94, 100 prior to cutting. In association with the base unit there is provided a combined punch, cutter and expander unit which demountably clips onto the base and has a common actuating handle for a punch 103, guillotine cutter 105 and expander

107 whose functions have already been described.

The complexity of the models which can be made depends on the facilities employed, and Figs 17(1)-17(6) and 18(1)-18(10) show the range of possibilities. These drawings are intended to be supplied with straws and the tools previously described as modelling kits, and to be understandable by children. They therefore do not need detailed description here. It will be apparent that models of considerable complexity can br produced simply by cutting straws to length and punching pairs of holes in them. In Figs 17(1)-17(6) a model swing uses these facilities and also takes advantage of the bendable corrugated regions of two of the straws to shape the seat. In Figs 18(1)-18(10) some of the straws are joined end to end by socket joints, and accessories (in this case wheels) are attached to the model using pins of the type previously described.

It will be appreciated that the embodiments described above are non-limiting, and that modifications may be made to them without departing from the invention.

CLAIMS

1. A model comprising a multiplicity of straws, wherein at least some straws are joined together with a first straw extending through a second straw via a pair of transversely aligned holes in the second straw, each of said holes being surrounded by portions of the second straw and the first straw fitting tightly within the holes in the second straw.

2. The model of claim 1, wherein at least some of the straws have a plurality of pairs of joint-defining transverse holes spaced longitudinally apart.

3. The model of claim 2, wherein at least some of the pairs of holes are aligned.

4. The model of claim 2, wherein at least some of the pairs of holes are spaced angularly apart.

5. The model of claim 4, wherein the angle is about 30, 45 or 60 degrees.

6. The model of any preceding claim, wherein at least some straws are joined longitudinally together by an end of one straw extending tightly into an enlarged socket end of another straw.

7. The model of any preceding claim further comprising at least one decorative or functional element that fits onto at least one straw and is held in place by a retaining element that is a push fit into an end of the straw.

8. The model of claim 7, wherein the decorative or functional element is a wheel, aircraft propeller or other accessory.

9. The model of any preceding claim, wherein a curved portion of the model is defined by at least one straw or portion thereof having a bendable corrugated region.

10. The model of claim 9, wherein at least one of the straws or portions thereof has a pair of said holes to one side of the bendable region.

11. The model of claim 9 or 10, wherein at least one of the straws or portions thereof has a pair of said holes to either side of the bendable region.

12. The model of any preceding claim, wherein the straw is of a plastics material.

13. The model of claim 12, wherein the straw is of polypropylene.

14. A model constructed from straws and jointed and assembled substantially as hereinbefore described with reference to and as illustrated in Figs. 17(1) to 17(6) or 18(1) to 18(10) of the accompanying drawings.

15. A method for making a model by joining straws together, comprising the steps of: punching a first straw with a punch having substantially the same external diameter as the straw so that the first straw becomes flattened and a pair of transversely aligned holes are formed which are separated by undamaged regions of the straw, allowing the straw to recover its shape and passing a second straw through the pair of holes in the first straw to form

a joint in which there is frictional resistance to axial and angular relative movement between the first and second straws.

16. The method of claim 15, further comprising the step of punching the first straw with at least a second pair of transversely aligned holes and passing at least a third straw through at least the second pair of transversely aligned holes

17. The method of claim 16, further comprising the step of passing a member through the first pair of holes after they have been punched so as to maintain the first straw in a predetermined angular position during the punching of said at least second pair of transversely aligned holes.

18. The method of claim 17, wherein the first straw is maintained in an angular position such that the second pair of transversely aligned holes is parallel to the first pair.

19. The method of claim 17, wherein the first straw is maintained at an angular position such that the second pair of transversely aligned holes is at a predetermined angle to the first pair.

20. The method of claim 19, wherein the angle is about 30, 45 or 60 degrees.

21. The method of any of claims 15-20, further comprising the step of joining straws longitudinally together by inserting an end of one straw tightly into an enlarged socket end of another straw.

22. The method of claim 21, further comprising the step of forming the

enlarged socket end in said other straw by internal pressure applied by means of an expander tool.

23. The method of any of claims 15-22, further comprising the step of fitting at least one decorative or functional element onto at least one straw and holding it in place by pushing a retaining element into an end of the straw.

24. The method of claim 23, wherein the decorative or functional element is a wheel or aircraft propeller.

25. The method of any of claims 15-23, wherein a curved portion of the model is defined by at least one straw or portion thereof having a bendable region.

26. The method of claim 25, wherein at least one of the straws or portions thereof is formed with a pair of said holes to one side of the bendable region.

27. The method of claim 25 or 25, wherein at least one of the straws or portions thereof is formed with a pair of said holes to either side of the bendable region.

28. A constructional system for making models out of straws, including a punch for punching pairs of transversely aligned holes through the straws, a cutter for cutting the straws to length and an expander for expanding ends of straws into receiving sockets.

29. The system of claim 28, wherein the punch is provided with means for setting and retaining the angular position of a straw during hole punching.

30. The system of claim 28 or 29, wherein the punch is provided a measuring guide and abutment means slideably positionable along said guide to facilitate forming pairs of holes in predetermined positions.

31. The system of claim 28, 29 or 30, wherein the cutter is provided with a measuring guide.

32. The system of any of claims 28-31, wherein a single machine having a common operating handle provides the functions of the punch, cutter and expander.

33. Apparatus for use in forming constructional models from straws, comprising a punch for forming in said straws pairs of transversely aligned holes separated by web portions of the straws, a cutter for cutting the straws to length, and an expander insertable into ends of the straws and expandable to form them into straw-receiving sockets.

34. The apparatus of claim 33, further comprising a common operating handle for operating the punch, cutter and expander.

35. The apparatus of claim 33 or 34, wherein a bed is formed with parallel guide tracks for straws leading through the punch and the cutter.

36. The apparatus of claim 35, wherein the expander has a pair of jaws directed parallel to the punch and cutter guide tracks.

37. A device for punching transverse holes in a straw comprising a punch and

die, and support means to either side of the punch and die for supporting flattened surrounding regions of the straw during formation of the holes.

38. The device of claim 37, further comprising guide means for locating the straw and guiding the straw longitudinally towards the punch and die.

39. The device of claim 37 or 38 further comprising a bed, guide means extending along the bed, a slider slideable along the guide means and means on the slider defining an abutment for longitudinal positioning of a straw relative to the punch and die.

40. The device of claim 39, further comprising means engageable in a first pair of holes formed in the straw for maintaining a predetermined angular position of the straw during the formation of at least one subsequent pair of holes.

41. The device of claim 40, further comprising a support in which said engageable means is angularly rotatable for adjusting the angular position of the straw during the formation of subsequent holes.

42. A device for punching transverse holes in a straw constructed and arranged to operate substantially as hereinbefore described with reference to and as illustrated in Figs 1 to 3 of the accompanying drawings.

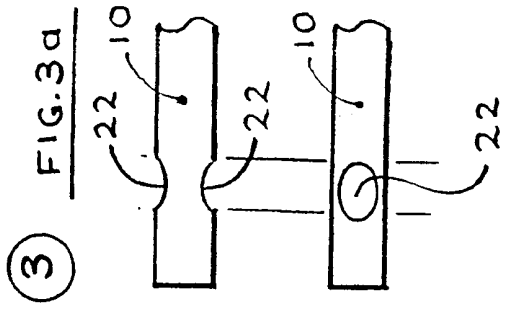


FIG.3a

FIG 3b

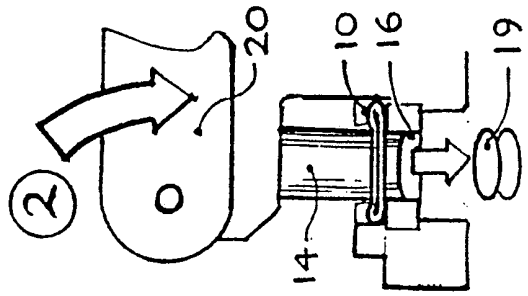


FIG 2b

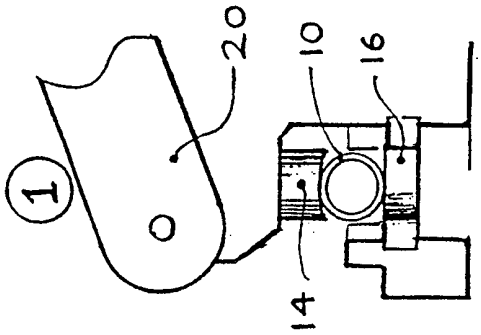


FIG.2a

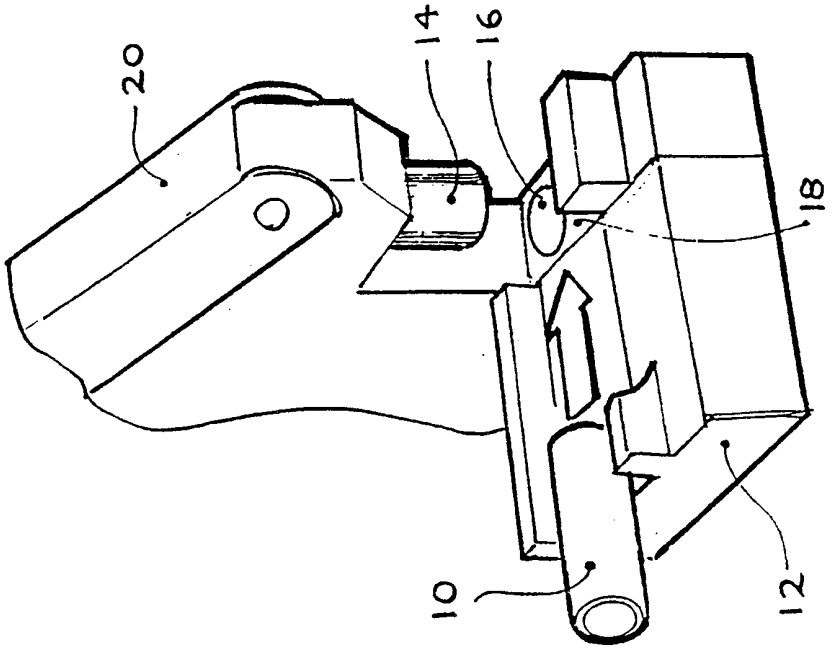


FIG. 1

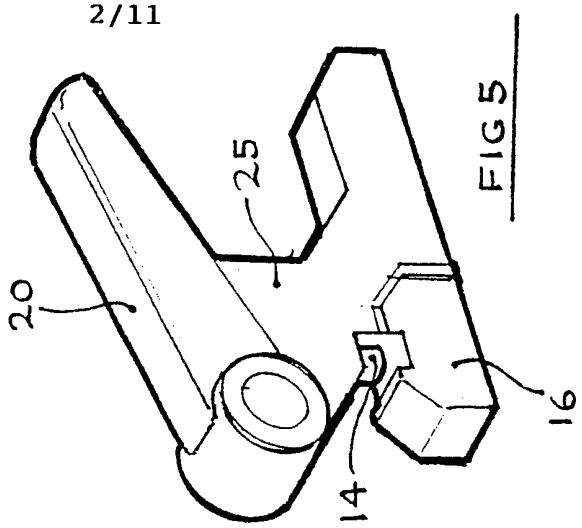


FIG 5

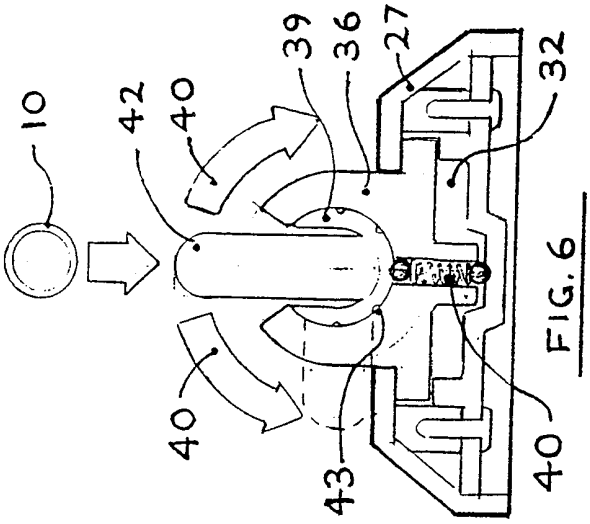


FIG. 6

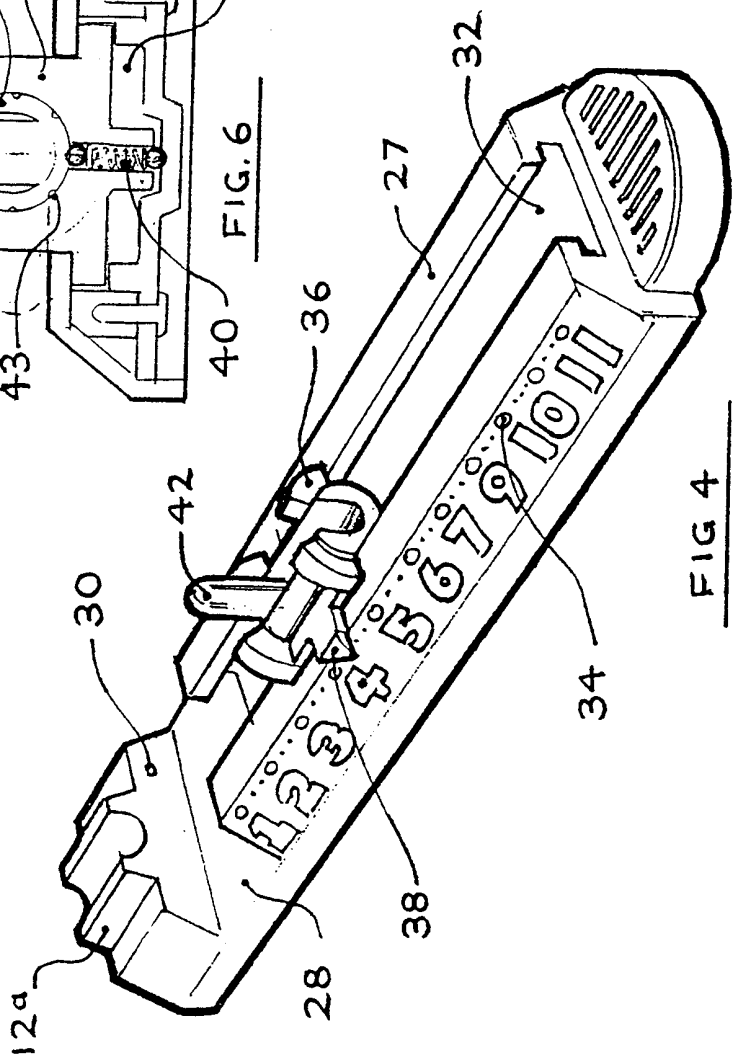


FIG 4

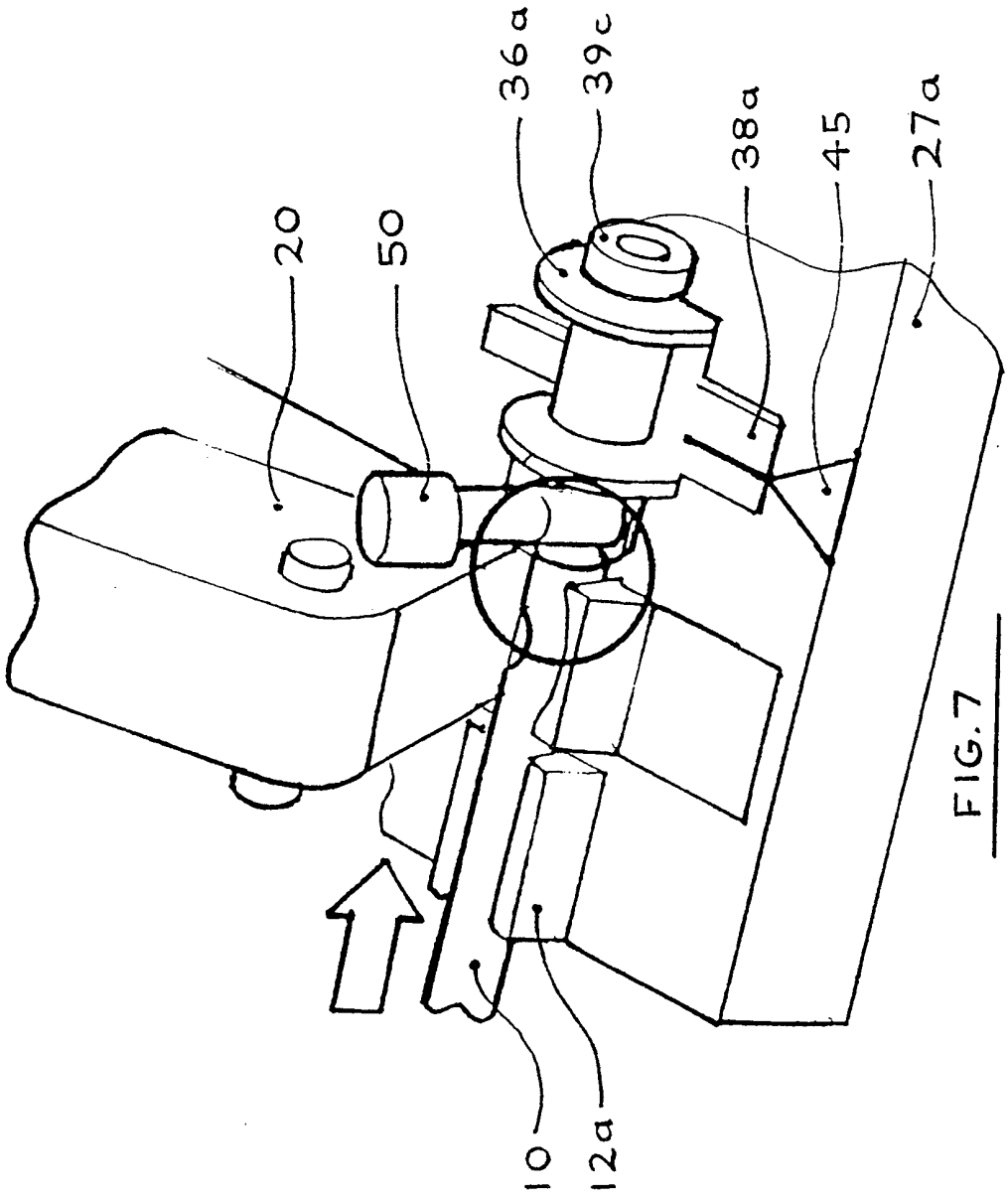


FIG.7

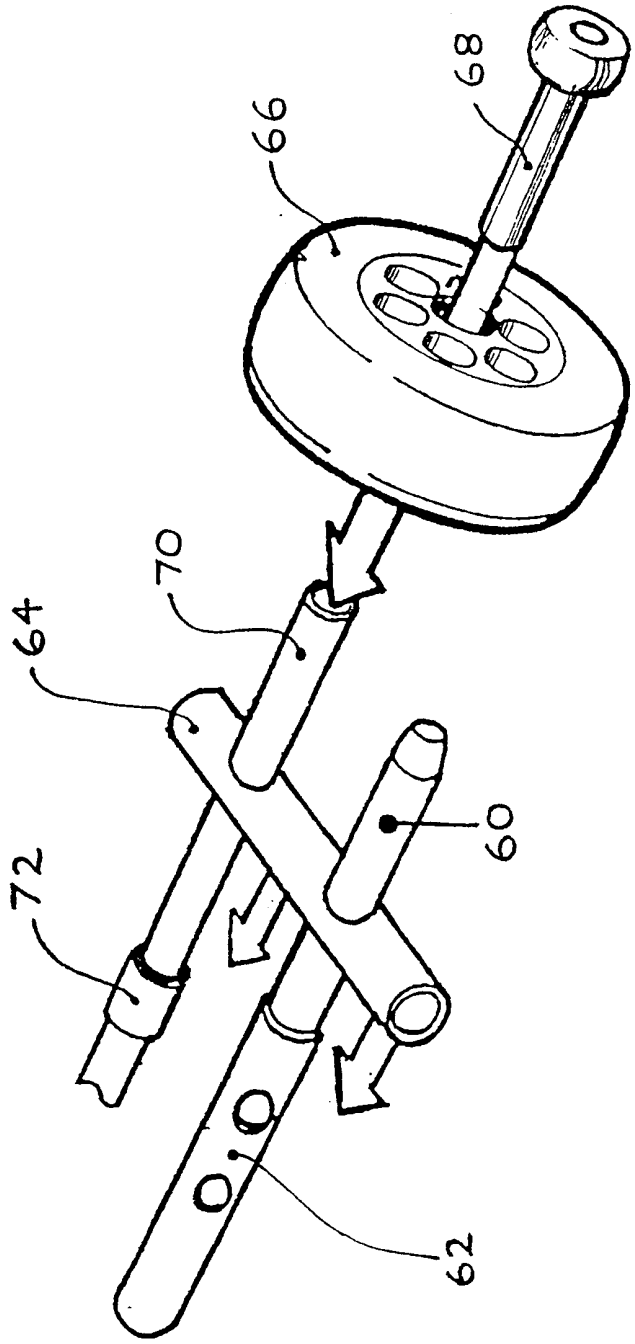


FIG 8

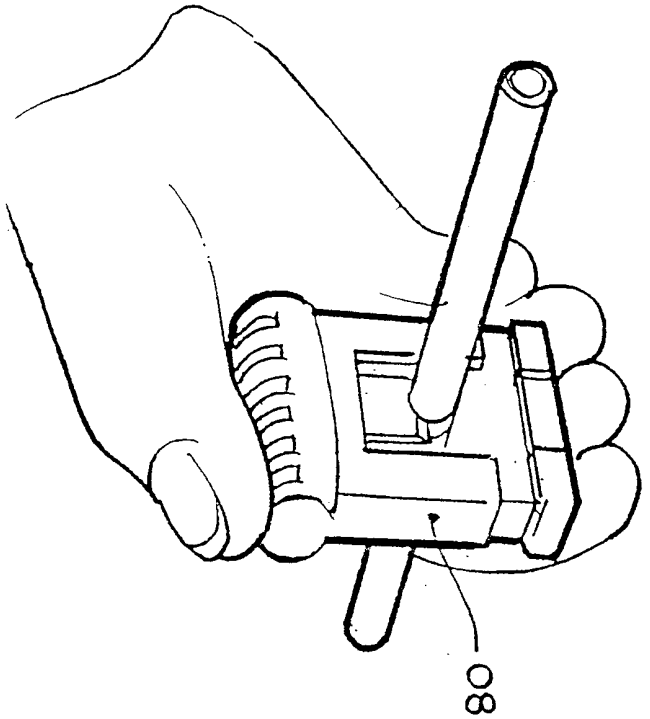


FIG 10

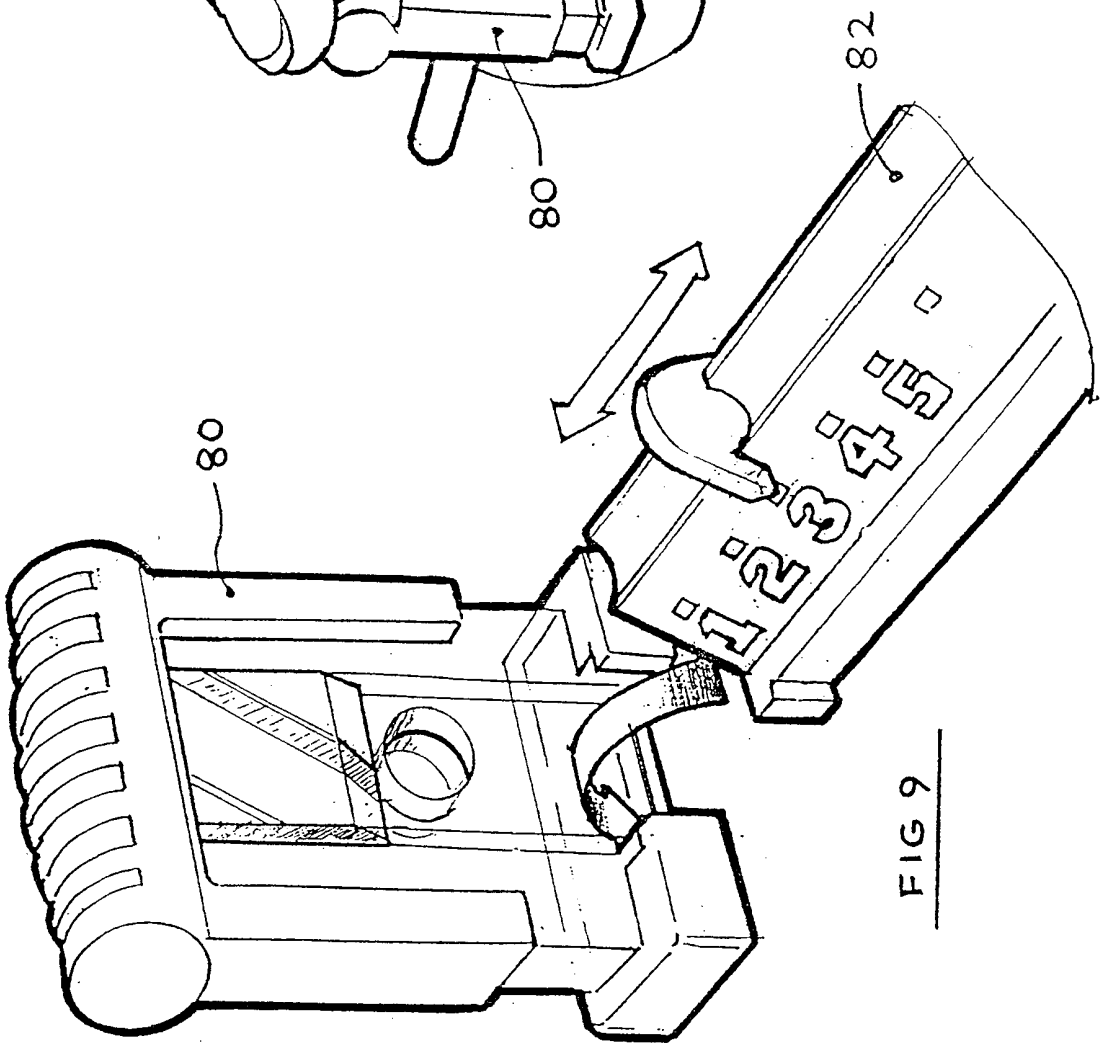


FIG 9

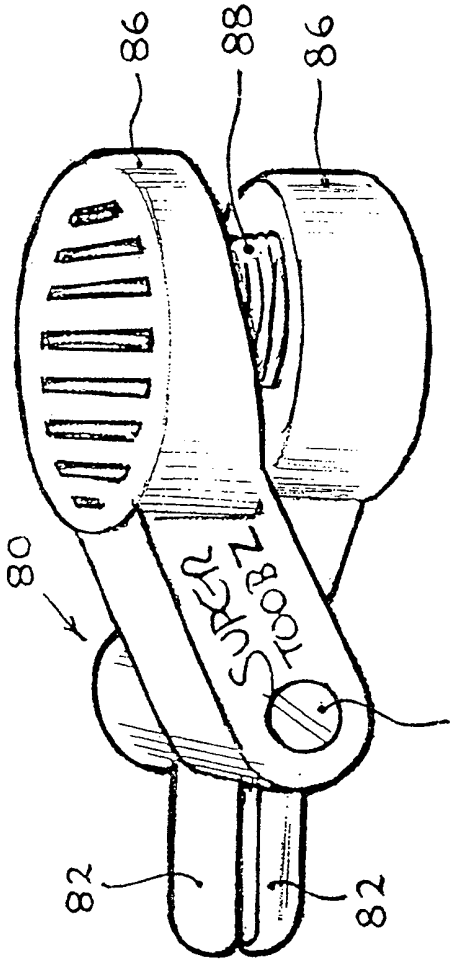


FIG 11

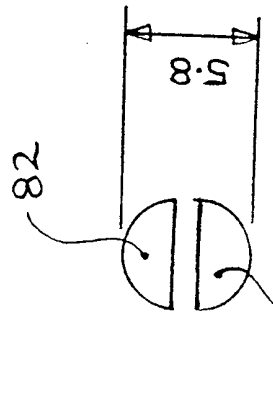
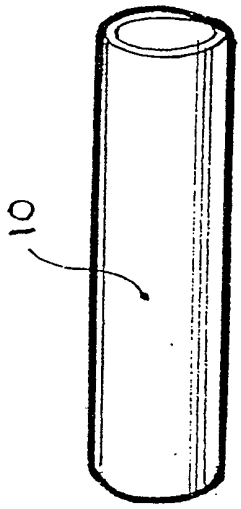


FIG 13



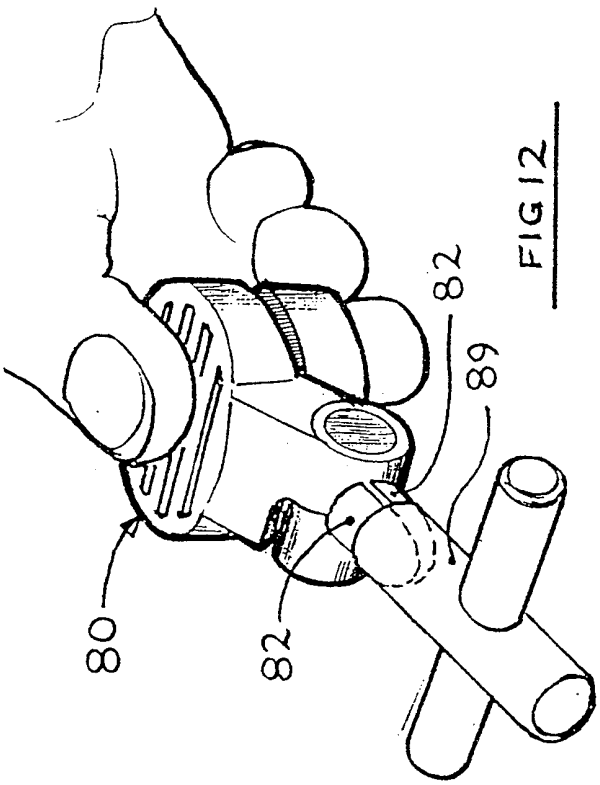
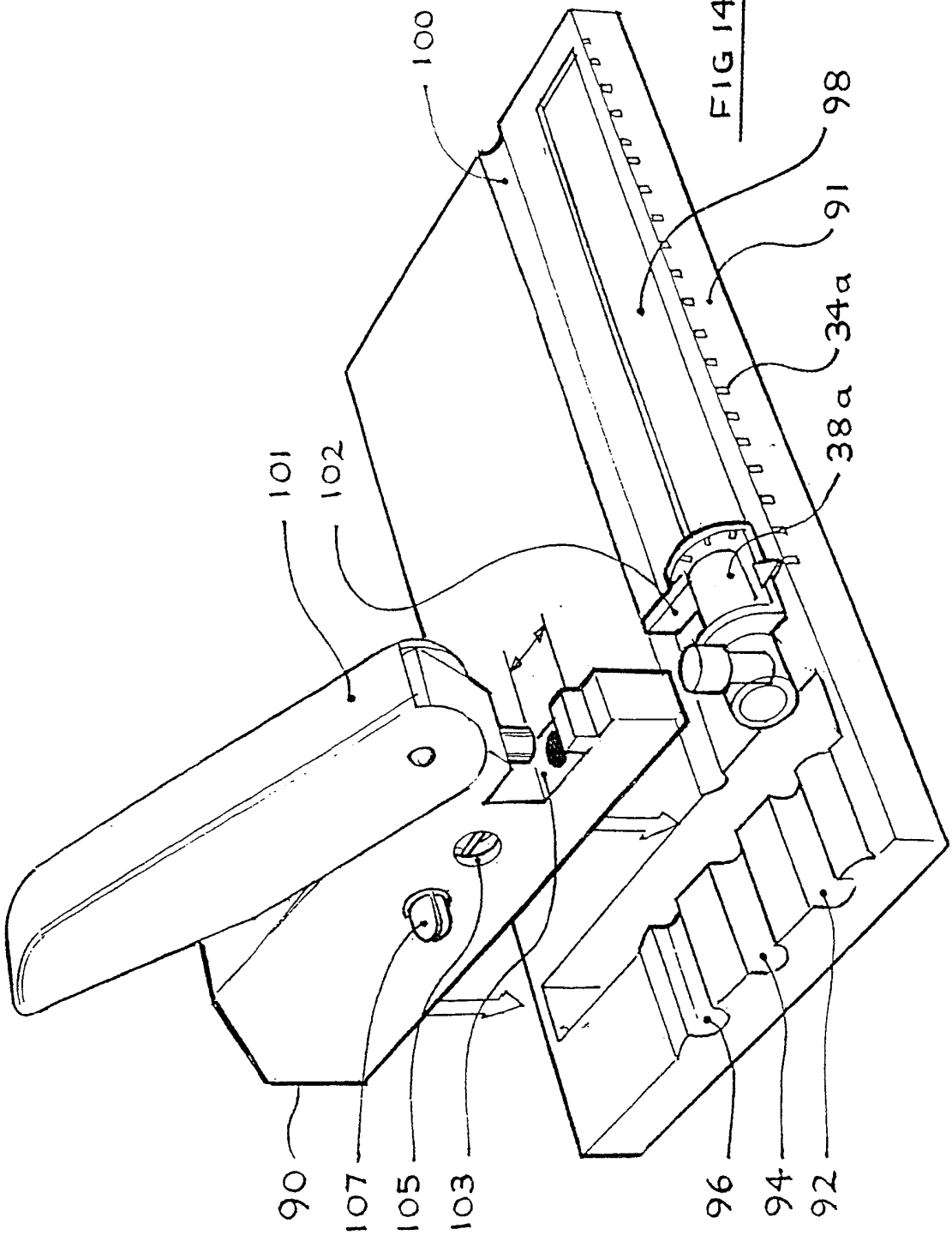
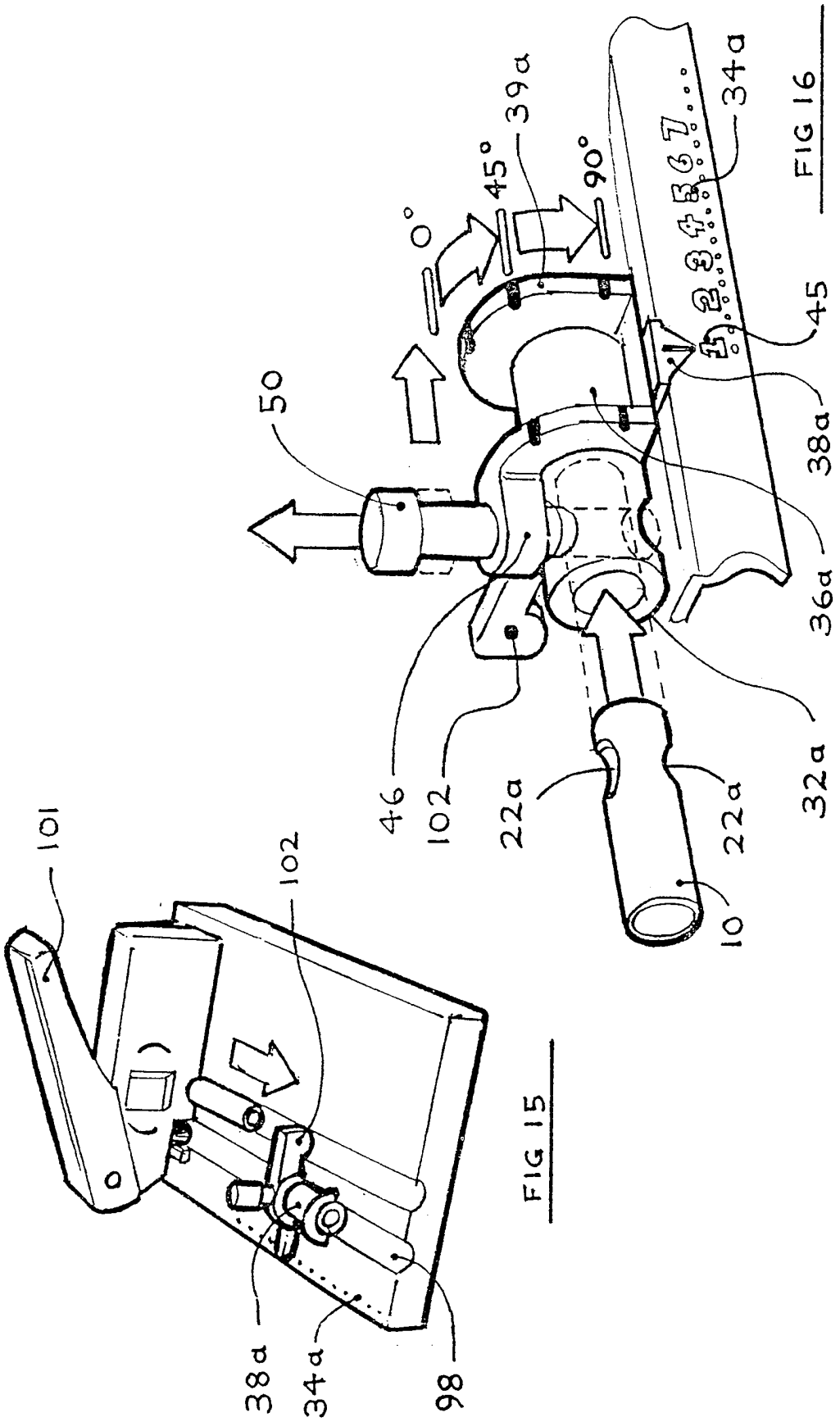


FIG 12

FIG 14




0°
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39a
34a
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36a
32a
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22a
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101
102
38a
34a
98

FIG 16

FIG 15

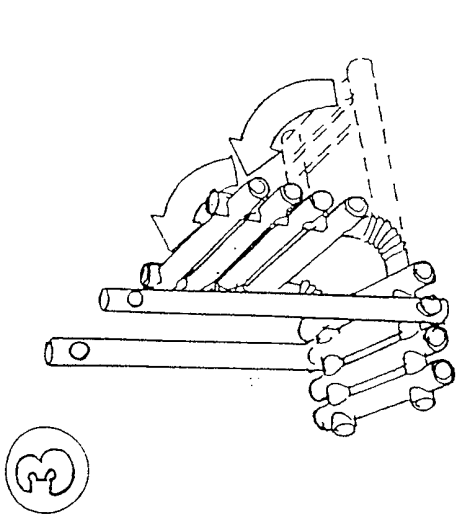

FIG 17(3)

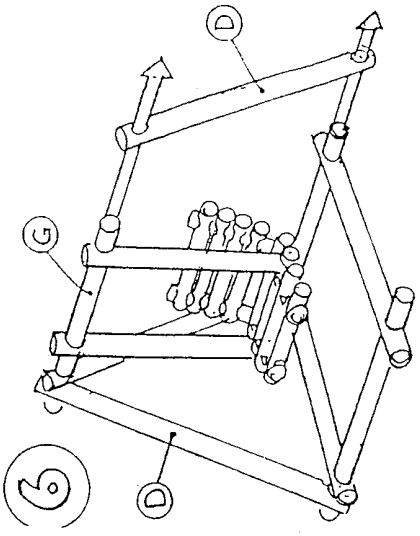

FIG 17(6)

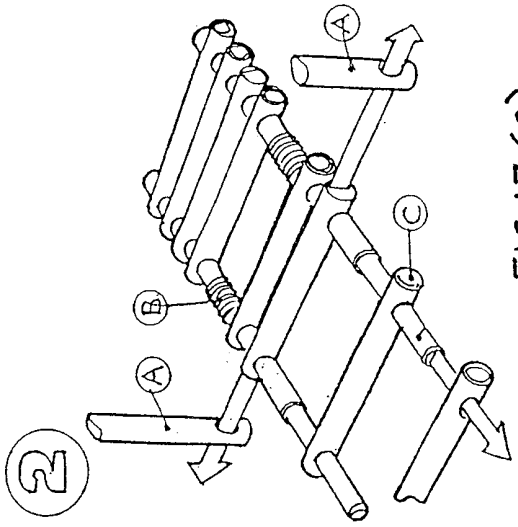

FIG 17(2)

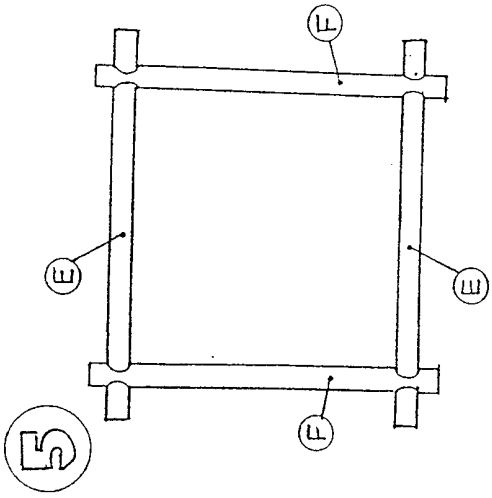

FIG 17(5)

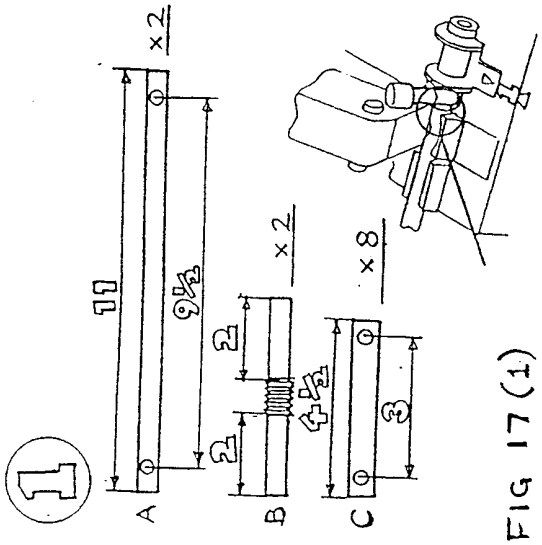

FIG 17(1)

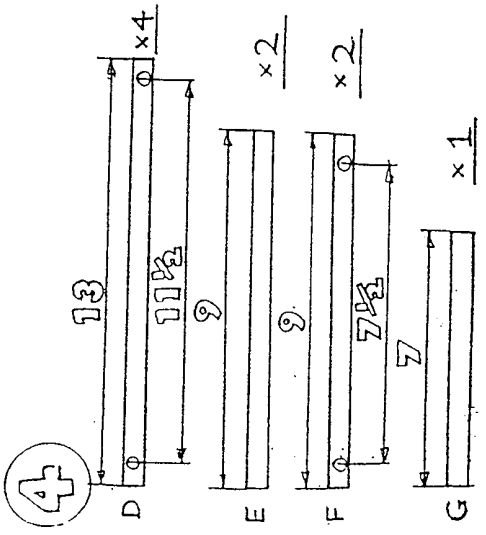

FIG 17(4)

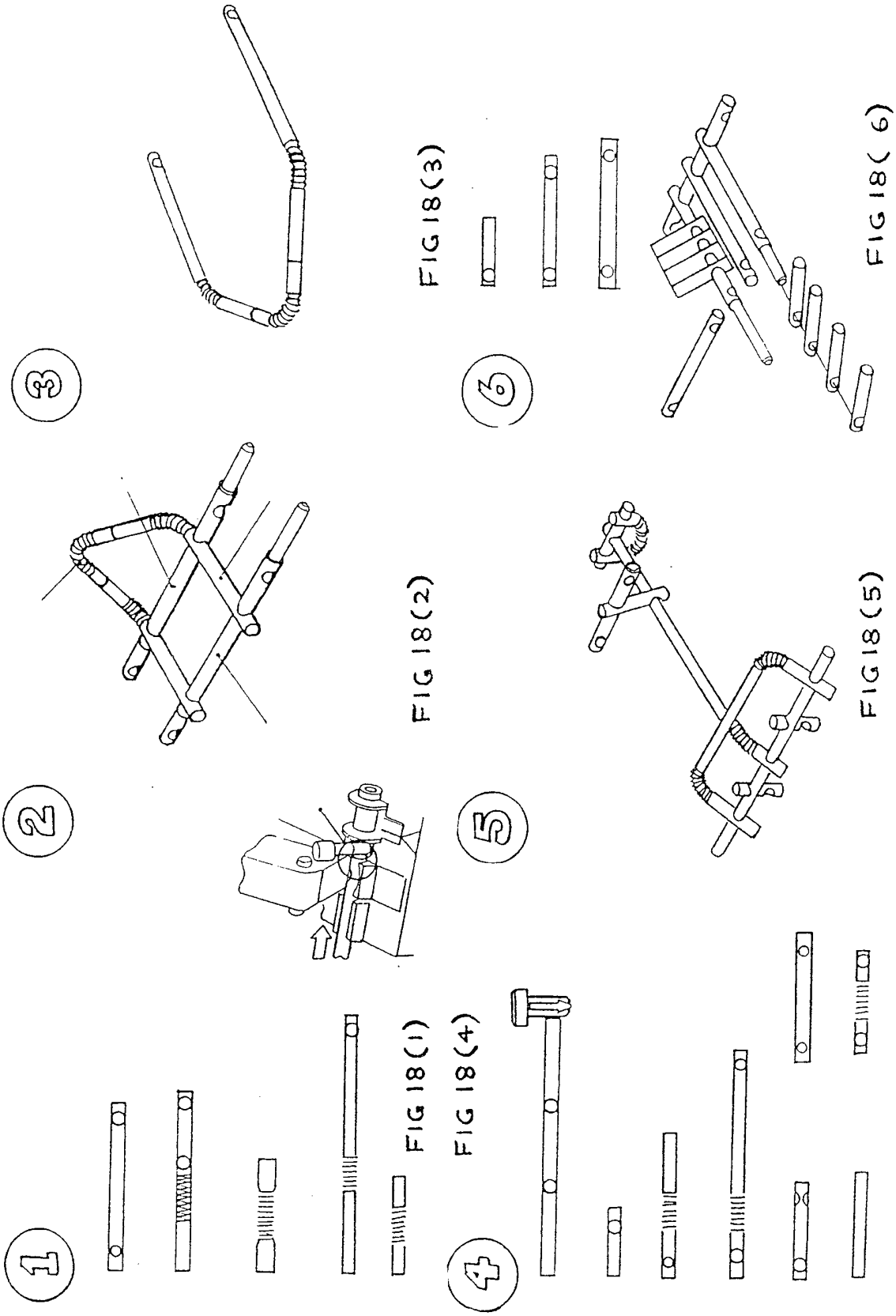
1
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FIG 18(1)
FIG 18(2)
FIG 18(3)
FIG 18(4)
FIG 18(5)
FIG 18(6)

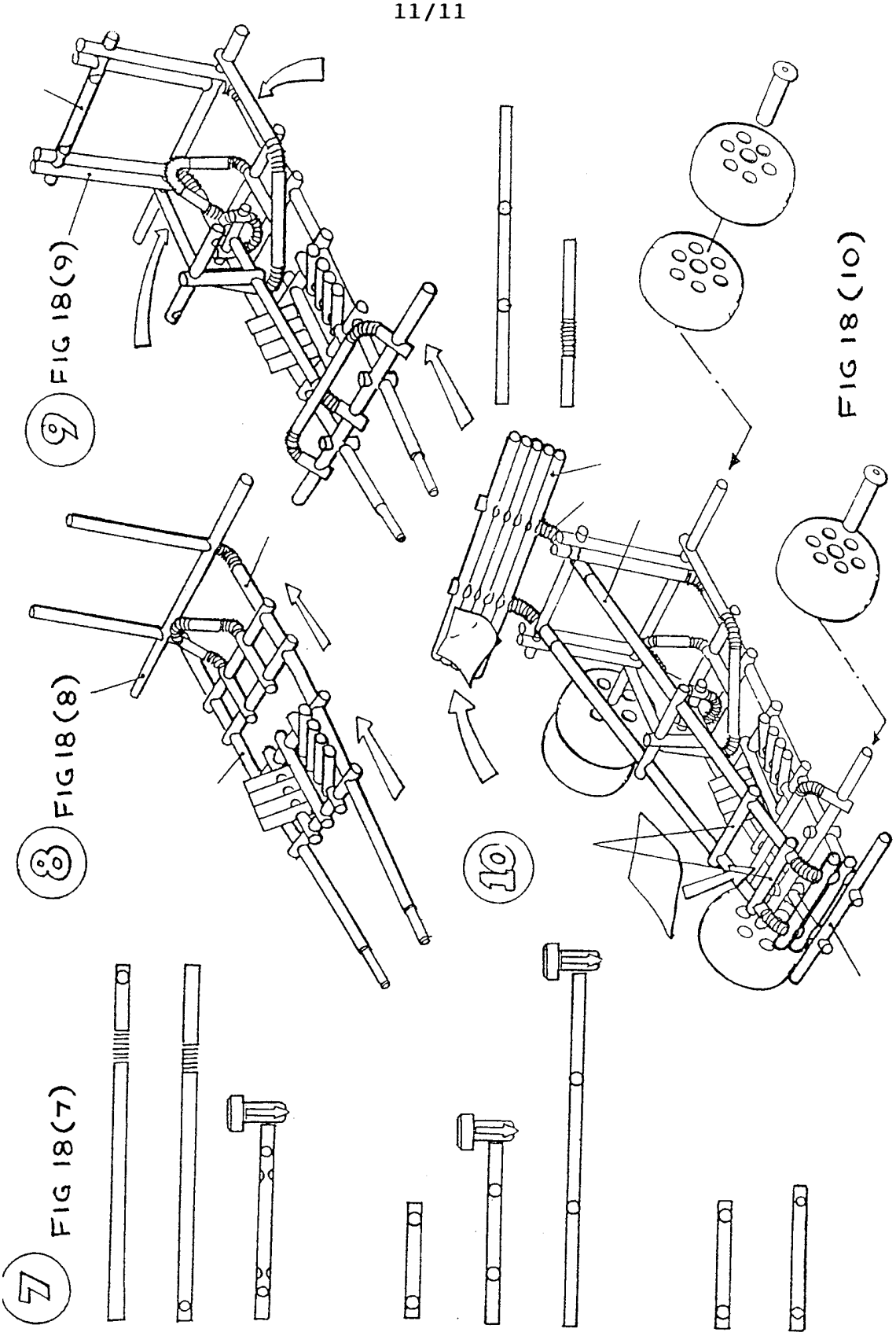
FIG 18(9)
9
FIG 18(8)
8
FIG 18(10)
10
FIG 18(7)
7

INTERNATIONAL SEARCH REPORT

Inte. onal Application No
PCT/GB 00/00795

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A63H33/06 A63H33/04 B26F1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A63H A47G B26F B26D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 469 339 A (THOMAS JOHN M) 30 September 1969 (1969-09-30) column 2, line 55 -column 3, line 15 figures 2-4	1-4,7,8, 12
A	---	15
X	US 4 274 222 A (ZAHN DAVID C ET AL) 23 June 1981 (1981-06-23) column 3, line 41-47 column 3, line 60 -column 4, line 16 figures 1-3	1,12
A	---	15
X	US 5 291 914 A (BARES JACK A ET AL) 8 March 1994 (1994-03-08) column 6, line 3-12 figures 5,6	37,38
A	---	28,33
	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 June 2000	21/06/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Chabus, H

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INTERNATIONAL SEARCH REPORT

Inte ional Application No
PCT/GB 00/00795

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 049 105 A (GLICKMAN JOEL I) 17 September 1991 (1991-09-17) column 1, line 30-34 column 1, line 45-50 column 2, line 49-53 figures 1,2	1,7,8, 12,13, 23,28, 31,33

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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims Nos.: 14 42

Rule 6.2 a) PCT

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte ional Application No
PCT/GB 00/00795

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3469339 A	30-09-1969	NONE	
US 4274222 A	23-06-1981	AU 5997380 A	05-11-1980
		EP 0028240 A	13-05-1981
		WO 8002234 A	30-10-1980
US 5291914 A	08-03-1994	NONE	
US 5049105 A	17-09-1991	NONE	