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54 A drainage foil for a web-forming machine.

57 A drainage foil comprising a hard wearing nose portion that includes the leading edge of the foil and which is normally permanently fixed to a web forming machine. The trailing part of the foil is detachable and has an upper surface parallel to, or at least in part downwardly inclined to, the upper surface of the nose portion. Among the advantages of the arrangement is the ability to alter the drainage effect of foils in a web forming machine by removal or substitution of the detachable portion while the machine is running so that the web forming cloth is supported during such interchange or removal and so that the nose portion is not damaged by the handling involved in removal or substitution of a foil.

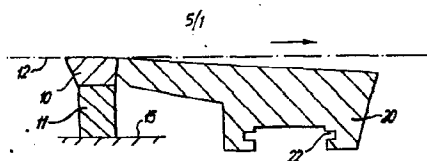


Fig. 1

EP 0 000 250 A1

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A Drainage foil for a web forming machine.

This invention relates to web forming machines such as paper making machines and more particularly drainage foils such as are located below a metal or plastic foundrinier wire in a paper making machine.

Drainage foils are well known devices employed in paper making machines. A drainage foil typically comprises an elongate body located below a forming fabric in a paper making machine transverse to the direction of movement of the fabric. The upper surface of the foil adjacent to the leading edge thereof is arranged to contact the forming fabric. Behind or downstream of that contact area the upper surface of the foil may be inclined downwardly.

Previously known plastic foils suffer from a number of disadvantages, the principal disadvantage being that there is wear of the surface in contact with the wire. Such wear can impair the drainage action of the foil. In an effort to deal with that problem it has become the practice to provide a hardened insert, for example of ceramic, adjacent to the leading edge of the foil although this practice can create other problems.

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If the drainage characteristics of a paper making machine need to be altered it may be necessary, to remove a foil or replace a foil with one having a different foil angle (that is the angle between the inclined upper surface of the foil and the general plane of the forming fabric). It has been found that the ceramic inserts in a plastic blade can be very easily damaged when the foils are handled because the foils tend to flex whereas the hard ceramic inserts do not flex. Because of that disadvantage it has become common practice not to change foils with ceramic inserts and that practice reduces the adaptability of the wire part of the paper making machine to meet varying production conditions.

Alternative designs have foil blades which are made entirely of ceramic or other wear resistant material. Some of these designs have fixed angle blades which are neither adjustable nor readily removable whilst others involve the mounting of the foils in such a manner that they can be pivoted about a longitudinal axis in order to change the foil angle. When foils of this latter design are adjusted, the position of the leading edge changes relative to the forming

wire. Significantly, the width and thickness of a full ceramic foil is unalterable.

The present invention has been made from a consideration of these problems.

According to the invention there is provided a drainage foil comprising wear resistant nose portion adapted to be mounted below a web forming fabric/wire, with the upper surface of the nose portion supporting said fabric and a detachable portion located downstream of the said nose portion, the upper surface of the detachable portion being parallel to, or at least a part thereof being downwardly inclined in the downstream direction to the upper surface of the nose portion.

In accordance with the invention therefore the nose portion, i.e. leading support part of the foil is permanently mounted in the paper making machine. (By permanently mounted we do not mean that the nose portion cannot be removed from the machine under any circumstances but that the nose portion is normally left in place on the machine when the detachable portion is removed). The nose portion is, as stated, made of a hard wearing material which may be ceramic, metal or plastics examples of which are aluminium oxide, silicon carbide and silicone nitride, and substrates coated with wear resistant materials such as flame plated tungsten carbide on a stainless steel substrate. Since the nose portion is only handled infrequently it can be made of a brittle material.

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The detachable portion is advantageously made of plastics and is preferably slidably mounted in the paper making machine. Since it does not contain any ceramic insert it can be handled without risk of damage thereto. If the foil angle and/or blade width or shape is to be changed the detachable portion can be replaced by another which has a different foil angle and/or blade width or shape. Alternatively the detachable portion can be removed entirely and not replaced in which case, it will be noted that the nose portion still provides support for the forming fabric.

The upper surface of the detachable portion may form a continuation of the upper surface of the nose portion or there may be a step between the upper surfaces of the nose portion and the detachable portion.

In addition this invention can be adapted to a variety of equipments in which a wear resistant support surface can be used to advantage in conjunction with an adjacent replaceable component, e.g. vacuum boxes.

Specific embodiments of the invention will now be described by way of reference to the accompanying

drawings in which:-

Fig. 1 is a transverse section through a drainage element having a foil; Figs. 2 to 4 show different modifications of

the foil of Figure 1;

Figures 5 to 7 are sections similar to that of Figure 1 through three further embodiments of drainage foils;

Figure 8 is an end elevation of another embodiment of a drainage foil;

Figure 9 is a part section on the line A-A of Figure 8;

Figures 10 to 14 are end elevations of five further embodiments, and

Figure 15 is a part top plan view of the embodiment of Figure 14 with the foil removed.

In the different embodiments, like parts have been given the same reference numerals.

Referring to Figure 1 the drainage foil comprises a hard wearing ceramic nose portion 10 the upper surface of which supports the forming fabric 12 of a paper making machine.

The nose portion is mounted on a support 11 and

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the support is fixed to a part of the machine 15. The nose portion 10 may be fixed to the support by any suitable means such as a dovetail joint, bolts, adhesive or a combination thereof. The support 11 may be made of any material such as metal or plastics.

Downstream of the nose portion 10 a detachable portion 20 preferably of plastics is located. The detachable portion is for convenience provided with a T-shaped slot 22 on its underside so that it can be slidably mounted on a T-bar such as is commonly provided in paper making machines. When mounted the upper surface of the portion 20 is inclined to the plane of the supporting surface of the nose portion 10.

Other means for mounting the detachable portion 20 can be employed if desired. For example in place of T-slot 22 a T-shaped bar can be provided which is received in a T-slot suitably located in the paper making machine. Other shapes can be adopted in place of the T-shape for example a dove tail.

In order to alter the foil angle width or shape the detachable portion 20 can be removed from the T-bar and, replaced by

one of a different angle width or shape. Alternatively the detachable portion may be removed so that only the wear resistant nose portion remains to support the forming fabric. Such changes are made without any disturbance of the nose portion 10 and whilst the machine is making paper.

It is desirable to ensure that, in use, the detachable portion does not move vertically relative to the wear resistant nose portion 10. To that end, as shown in Figure 2, a projection 17 is provided on the support 11 which is received in a slot 19 in the detachable portion 20.

An arrangement to give the same effect is shown in Figure 3 wherein a projection 21 on the detachable portion 20 is received in a recess 23 in the nose portion 10.

The nose portion may be mounted on the paper making machine in other ways, for example as shown in Figure 5. The lower part 14 of the nose portion is seated in a channel 16 fixed to the paper making machine and held in the channel by a wedge 18. The wedge is secured to the channel 16 by bolts (not shown) or other suitable means.

It will be understood that there are many other ways in which a nose portion and detachable portion can be mounted in a paper making machine. For example, the channel 16 in which the nose portion is mounted can have a T-shaped slot in its under surface so that the channel can also be mounted on a T-bar.

If desired the nose portion and detachable portion can be linked together. An example of that arrangement is shown in Figure 6. In that embodiment the nose portion 10 is dovetailed as at 24 into a support 26. The support has a T-shaped slot 28 in its under surface whereby it can be mounted on a T-bar. A flanged lug 30 is provided on the rearward side of the support onto which the detachable portion 20 is mounted.

Another embodiment in which the nose and detachable

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portions are linked is illustrated in Fig.7. That embodiment is similar to Fig.5 except that the part 16 has a T-shaped bar 32 on which the detachable portion is slidably received.

With two part foils it may be important that the junction between the parts can be made liquid tight. Preferably a liquid-tight junction is produced by urging the detachable portion towards the nose portion. To assist in forming a liquid-tight junction the part of the detachable portion that engages the nose 10 or the nose support 11 can be made resiliently deformable for example as shown in Fig.4. The parts are mounted so that the detachable portion is urged against the nose or nose support with deformation of the part 25 thereby ensuring that there is no through gap between the nose or nose support and the detachable portion.

The means for urging the detachable portion towards the nose portion may be mounted on the detachable portion and bear against a part of the foil support or be mounted on the foil support and bear against the detachable portion.

Referring to Fig.8 and 9 of the drawings the drainage foil comprises a nose portion 10 of hard wearing material such as ceramic and a detachable portion 20 provided on its underside with a T-shaped slot 22. As can be seen in Fig.8 the T-slot 22 and T-bar 40 are dimensioned so as to provide transverse clearance thereby permitting limited movement of portion 20 towards and away from the nose portion 10.

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At intervals along the T-bar a cut out 42, for example as illustrated in Figure 9, is formed in the side thereof adjacent the nose portion. A leaf spring 44 is mounted in the cut out, as by a screw 46. The spring is arranged to bear against the portion 20 of the foil so as to urge it against the nose portion 10 and form a liquid tight joint at the junction of the two portions 48.

The embodiment of Figure 10 is similar to that of Figures 1 and 2 except that the spring 44 is mounted externally and bears against the rear face of detachable portion 20.

Figure 11 illustrates an arrangement in which the spring of the embodiment of Figure 10 is replaced by a roller or disc 50 of resiliently deformable material such as rubber. The roller or disc is mounted on a vertically disposed shaft 52 so as to bear against the rear face of detachable portion 20.

Instead of urging the portion 20 towards the nose portion 10 by means mounted on the frame of the paper making machine and bearing on the portion 20 it is possible to reverse the arrangement and provide means on the portion 20, which bear on the machine frame.

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An embodiment of that kind is shown in Fig. 12 wherein a spring loaded ball 54 is located in a bore 56 in the detachable portion 20 so as to act on the front face of the T-bar 40.

In the embodiment of Fig. 13 a hollow deformable tube 60 is located in a channel 62 defined between the detachable portion 20 and the front of the T-bar 40. By expanding the hollow tube, for example hydraulically or pneumatically the portion 20 is urged towards the nose portion 10. There are many other arrangements which can be constructed by which the detachable portion is urged towards the nose portion.

Referring now to Figs. 14 and 15 the embodiment shown therein comprises a T-bar wherein the top flange defining part 70 is movably mounted on the web part 72 by means of bolts 74 extending through angled slots 76, in part 70 into part 72. Longitudinal movement of part 70 causes lateral movement thereof whereby the detachable portion 20 can be urged towards the nose portion 10.

It is to be understood that while the description of the various embodiments has generally only referred to a single means for urging part 20 towards 10 there would in practice be a plurality of such means along the length of the foil.

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Many further modifications can be made if desired. For example the nose portion 10 may for convenience be made up from a plurality of sections across the width of the paper making machine.

In addition, as illustrated in Figures 1 and 2 the T-shaped slot is provided with a shallow recess in the upper surface thereof so as to reduce the area of contact between the part 20 and the T-bar. This assists mounting, and removal; if part 20 on the T-bar.

Although the drawings show the T-bar being symmetrical it need not be so. It may be desirable to increase the width of the upstream flange to ensure that the part 20 cannot become disengaged from the T-bar when it is urged towards the nose portion.

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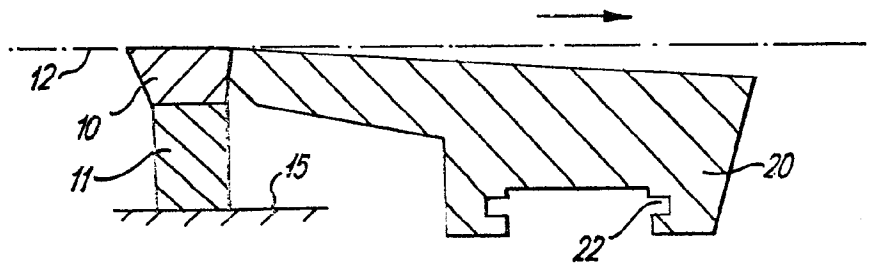
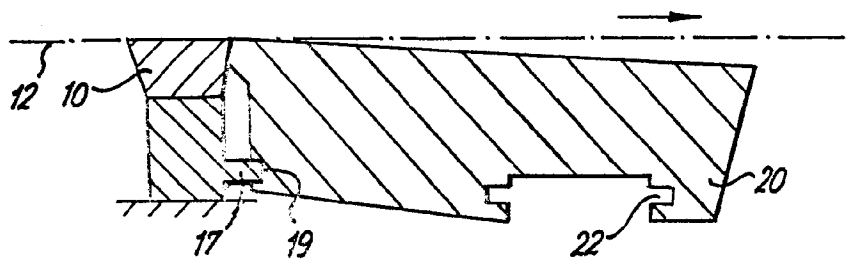
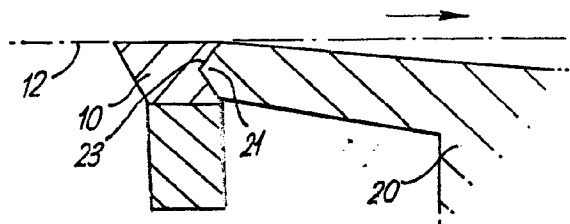
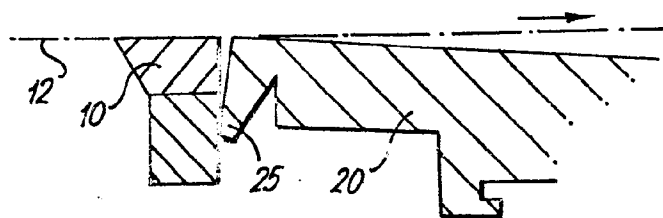
Claims.

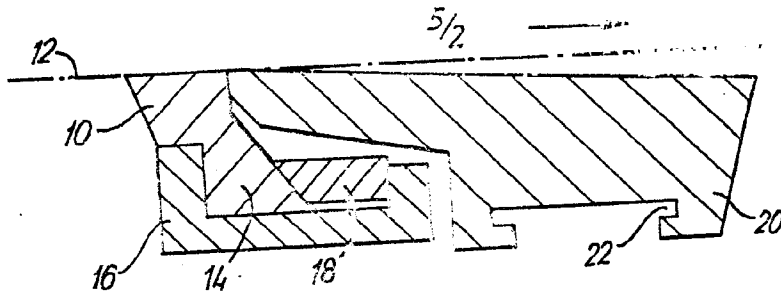
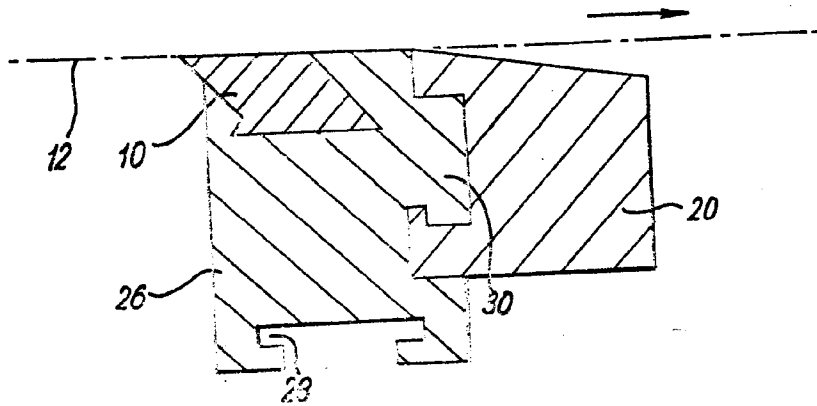
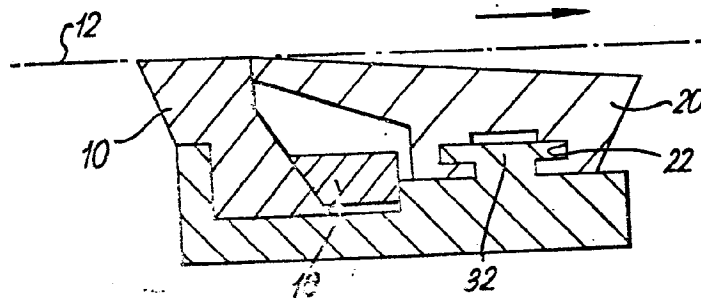
1. A drainage foil for a web forming machine having a nose portion, the upper surface of the nose portion adapted to support a web forming fabric and a second portion integral with the nose portion having an upper surface downwardly inclined from the upper surface of the nose portion, characterised in that the second portion is detachable from the nose portion and in that of the said nose portion, the upper surface of the detachable portion is parallel to, or at least a part thereof is downwardly inclined in the downstream direction to the upper surface of the nose portion.
2. A drainage foil as claimed in Claim 1, wherein the nose portion is made of ceramic, metal or plastics or comprises a substrate coated with ceramic, metal or plastics.
3. A drainage foil as claimed in Claim 1 or Claim 2, wherein the detachable portion is made of plastics.
4. A drainage foil as claimed in any preceding Claim, wherein means are provided for urging the detachable portion towards the nose portion.

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5. A drainage foil as claimed in Claim 4, wherein the means for urging the detachable portion towards the nose portion is mounted on the detachable portion and bears against a part of the foil support.
6. A drainage foil as claimed in Claim 4, wherein the means for urging the detachable portion towards the nose portion is mounted on the foil support and bears against the detachable portion.
7. A drainage foil as claimed in any preceding claim wherein means are provided for preventing upward or downward movement of the detachable portion relative to the nose portion.
8. A drainage foil as claimed in any preceding claim, wherein the part of the detachable portion adjacent the nose portion is resiliently deformable.
9. A web forming machine having a drainage foil as claimed in any preceding claim.

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FIG. 1FIG. 2FIG. 3FIG. 4

FIG. 5FIG. 6FIG. 7

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FIG. 10

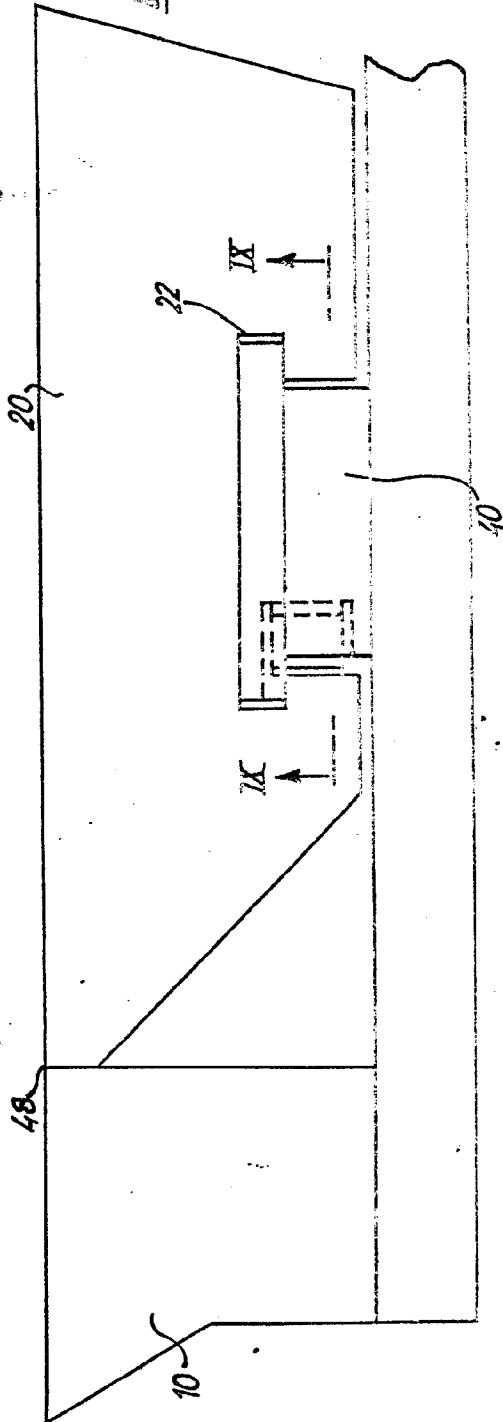


FIG. 11

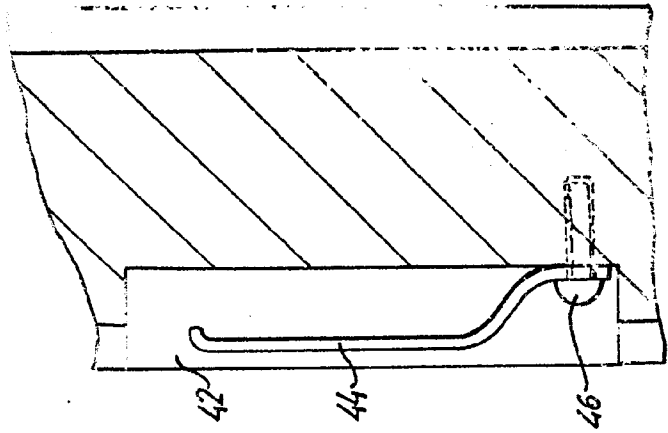
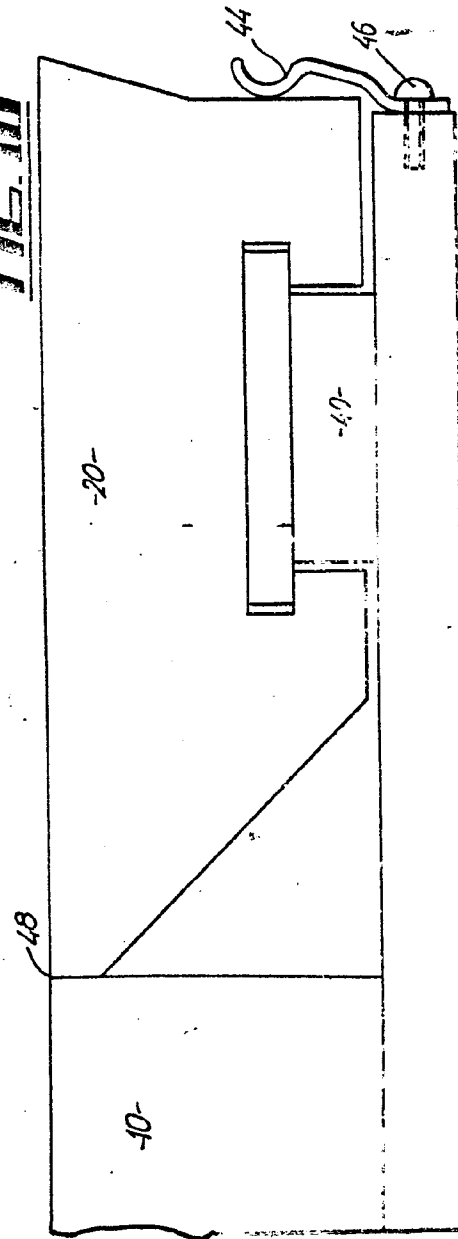
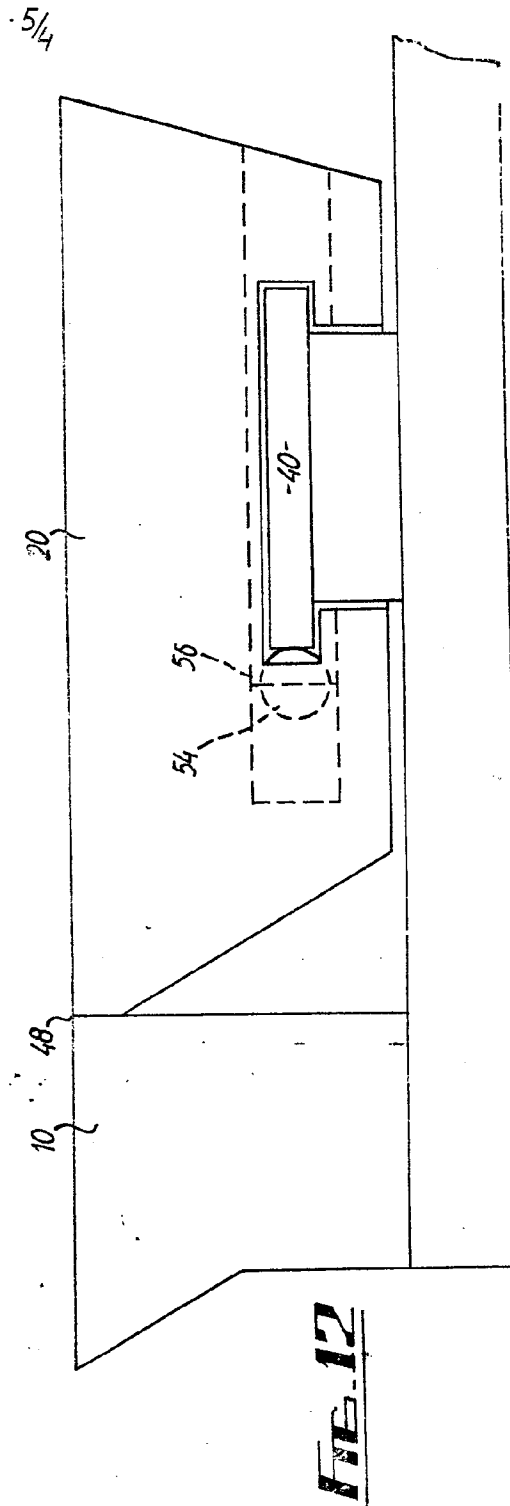
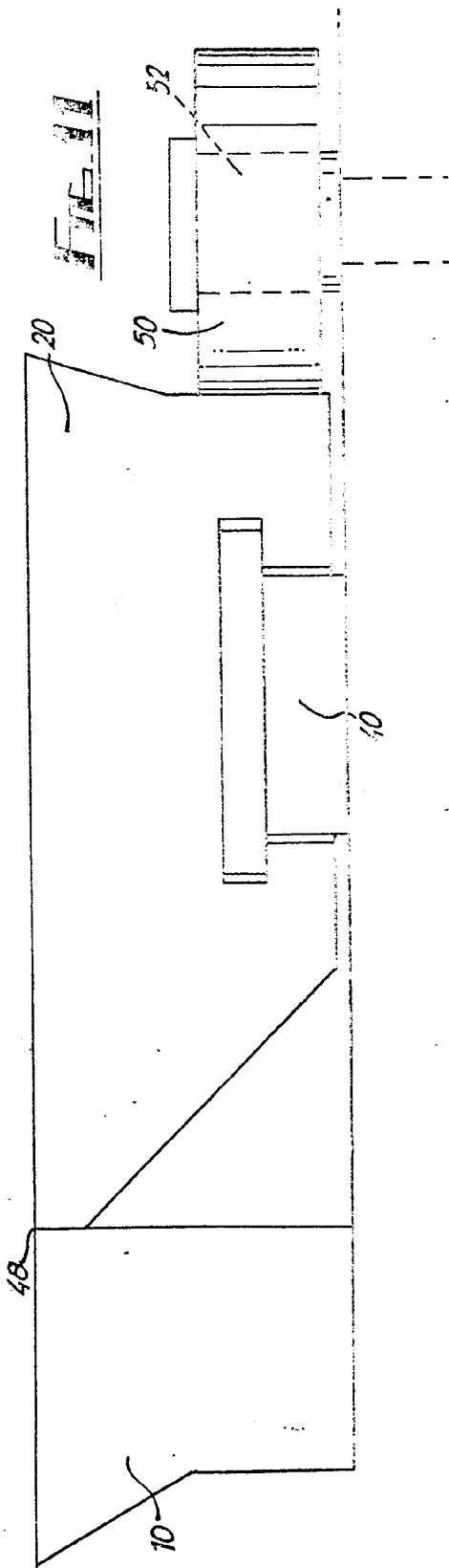
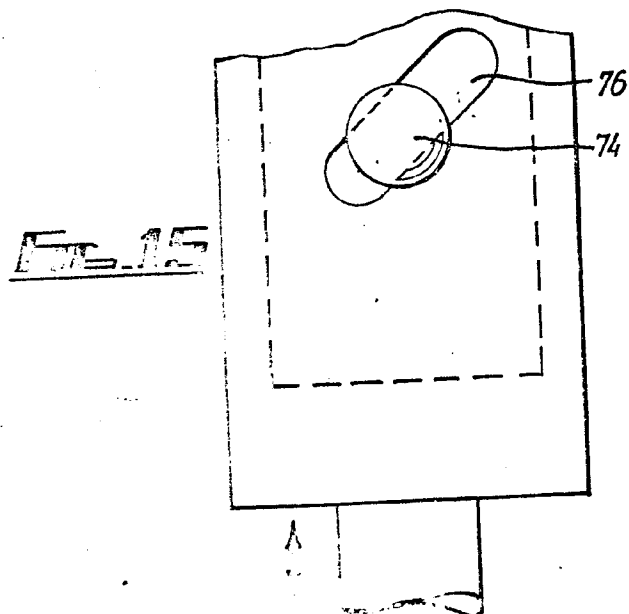
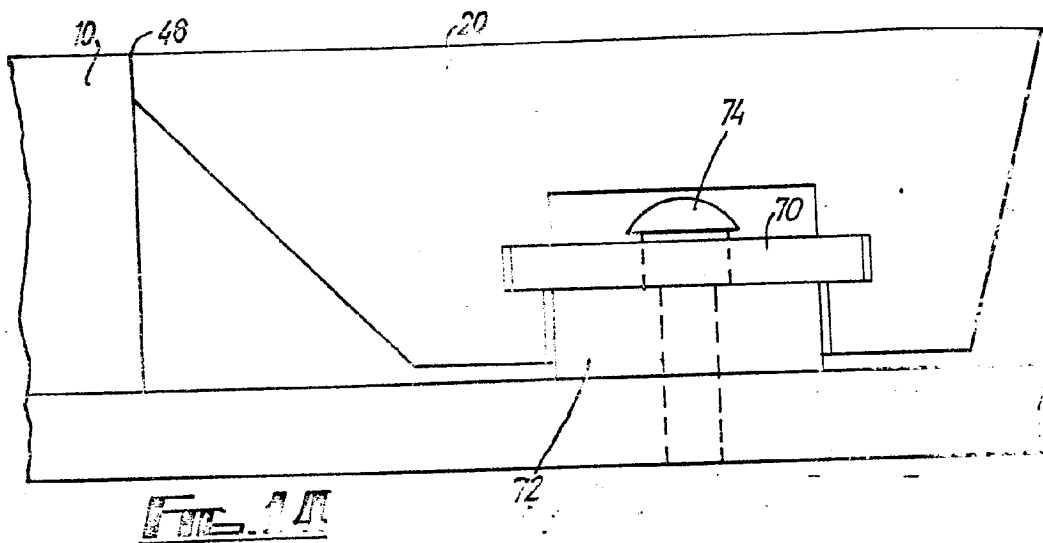
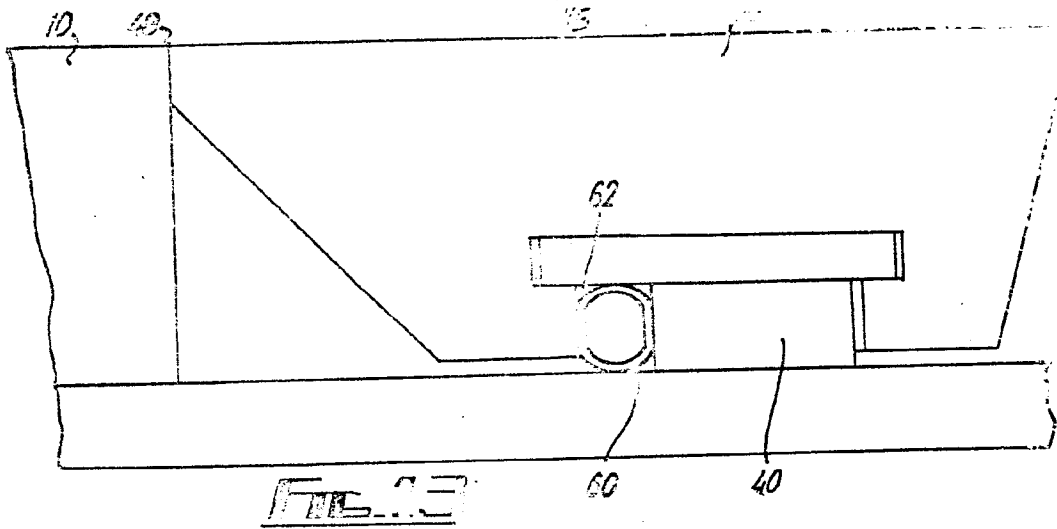


FIG. 12









DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	<u>CH - A - 545 375</u> (ESCHER WYSS) * Whole document *	1-3,7
A	<u>US - A - 3 870 597</u> (GETMAN et al.) * Whole document *	1,4
A	<u>GB - A - 1 291 332</u> (VOITH) * Whole document *	1,4
A	<u>US - A - 3 337 394</u> (WHITE et al.) * Whole document *	1,4

CLASSIFICATION OF THE APPLICATION (Int.Cl.)

D 21 F 1/43

TECHNICAL FIELDS SEARCHED (Int.Cl.)

D 21 F 1/48

CATEGORY OF CITED DOCUMENTS

- X: particularly relevant
- A: technological background
- O: non-written disclosure
- P: intermediate document
- T: theory or principle underlying the invention
- E: conflicting application
- D: document cited in the application
- L: citation for other reasons

X

The present search report has been drawn up for all claims

Place of search

Date of completion of the search

Examiner