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(54) Method and apparatus for packaging material.

(57) A discharge chute (2) for use in packaging materials, such as hay and green herbage, is an elongate hollow body formed of two substantially U-shaped channel members (6). A bag is positioned around a discharge opening (30) of the chute and then a block of the material to be packaged is forced along the chute (2) towards the discharge opening (30). The block, and the means to force it along the chute, is larger than the chute (2) whereupon the two channel members (6) are moved apart. This holds the bag in position on the chute. Simultaneously, pressure is applied to counteract the expansion of the chute (2) by hydraulic cylinders (22).

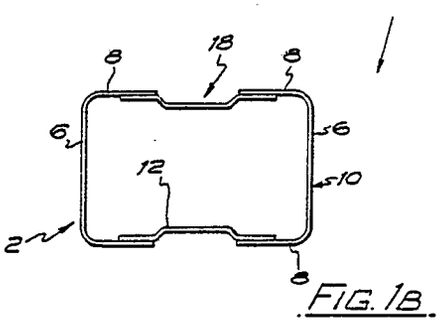

FIG. 1B

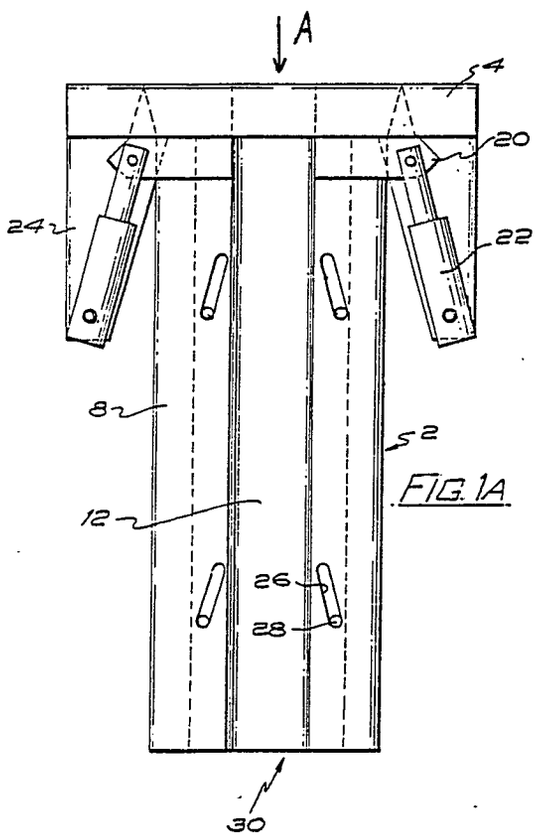

FIG. 1A

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METHOD AND APPARATUS FOR PACKAGING MATERIAL

The present invention relates to a method and apparatus for packaging material, and also to a chute for enabling the material to be packaged.

Frequently it is required to package fodder, such as hay or green herbage for transport and/or storage. However, because of its bulk there are problems in packaging such material. For example, if the material is simply wrapped or bagged it is extremely bulky. Accordingly, the material is generally compacted before wrapping. However, the compacted material is able to expand before and during packaging and this makes it difficult to control the volume of the completed package.

The present invention seeks to provide an improved method and apparatus for packaging material.

According to a first aspect of the present invention there is provided a method of packaging material comprising the steps of positioning a bag or other container with a closed end around a chute having a discharge opening such that said discharge opening is within the container, and forcing a quantity of material through said chute towards said discharge opening, wherein the material is arranged to expand the volume of said chute against a constraining force whereby the container is retained on the chute and the density of material within the chute determined.

Preferably, the constraining force is a pressure applied to the chute to oppose its expansion. This pressure may be preset and/or adjustable such that the density of the material within the chute can be chosen and is preferably arranged to obtain an even density of the material within the chute.

The method preferably further comprises the step of continuing to force the material through the chute until the filled container is pushed off the chute.

Preferably, the chute is an elongate hollow body having the discharge opening at one end thereof. The bag is arranged to take up a similar configuration to that of the chute such that expansion of the volume of the chute brings the outer peripheral surface of the chute into close contact with the periphery of the bag, with the closed end of the bag closing the discharge opening. Further expansion of the chute then acts to apply stretching forces to the container. Preferably, the step of forcing a quantity of material through the chute comprises pushing a block of material through the chute. Preferably, this block of material has a peripheral shape similar to that of the chute. Furthermore, at least one dimension of the block is at least the same as, but preferably greater than, a corresponding dimension of the chute. Thus, pushing the block through the chute is arranged to expand the volume of the chute.

Preferably, the material is pushed into and through the chute by way of a ram. The ram head has at least one dimension, transverse to its direction of movement through the chute, which is greater than the corresponding transverse dimension of the chute in its non-expanded state.

The constraining force may be applied by biasing means which are, for example, hydraulically or pneumatically operated. In addition, the resistance to expansion of the container also acts as a constraining force.

In a preferred embodiment a method of packaging material comprises the steps of positioning a bag around an elongate hollow chute having a discharge opening at one end such that the periphery of the bag surrounds the peripheral surface of the chute and the closed end of the bag extends across and closes the discharge opening, pushing a block of material through the chute towards said discharge opening and simultaneously applying a constraining force to said chute, a dimension of the block of material transverse to the longitudinal extent of the chute being greater than a corresponding transverse dimension of the chute such that pushing the material through the chute causes the expansion of said dimension of the chute against the action of the constraining force, and continuing to push the material until the bag containing the block of material is pushed off the chute.

Preferably, the material is pushed through the chute by way of a ram. Preferably, as the ram head enters the chute the constraining force is released.

According to a further aspect of the present invention there is provided apparatus for packaging material comprising a chute having a discharge opening arranged such that a bag or other container with a closed end can be positioned around the chute with the discharge opening within the container, and means for pushing material through the chute to said discharge opening, wherein the chute is constructed such that its volume can be expanded, and further comprising force applying means arranged to apply a constraining force to said chute.

In an embodiment, the means for pushing material through the chute comprises a ram. Furthermore, the force applying means may comprise biasing means which may be hydraulically or pneumatically operated. In an embodiment, said biasing means comprise one or more pneumatic cylinders.

The present invention also extends to a discharge chute comprising a hollow body in which a discharge opening is defined, wherein the hollow

body is constructed from at least two wall members arranged to have overlapping regions and to be movable relative to one another such that relative movement of the wall members away from each other can increase the volume of said hollow body.

In an embodiment, said chute is an elongate hollow body having a substantially rectangular cross-section.

Preferably, the hollow body is formed by two elongate channel members which are substantially U-shaped in cross-section and which are arranged with their openings facing. Each channel member has two spaced sides interconnected by a base member. Preferably, the channel members are arranged such that their base members form two spaced end walls of the hollow body. In one embodiment each side of one channel member is in overlapping arrangement with a corresponding side of the other channel member, thereby defining a respective side wall of the chute which may be extended by moving the channel members away from each other. In an alternative embodiment, each side wall of the hollow body is defined by a side plate interposed between a respective side of each channel member, part of each side of each channel member overlying said side plate. Movement of the channel members away from each other thus causes extension of the side wall by movement of the two sides of the channel members away from each other.

Preferably, the overlapping wall regions of the hollow body are connected together by connecting means. These connecting means can be arranged to control the volume increase of the chute. For example, the connecting means may comprise an inclined elongate slot in one of said overlapping wall regions and a corresponding projection protruding from the other of said wall regions and engaged in the slot for movement therealong.

Embodiments of the present invention will hereinafter be described with reference to the accompanying drawings, in which:

Figure 1A shows an elevation of a discharge chute of the invention,

Figure 1B shows an end elevation of the discharge chute of Figure 1A,

Figure 2 shows a view similar to that of Figure 1A but showing the chute in an expanded condition, and

Figure 3 shows a hydraulic circuit for actuating the cylinders of the chute of Figures 1A and 2.

Figure 1A shows a discharge chute 2 for use in packaging materials, particularly straw like bulky materials such as hay and green herbage. The chute 2 is an elongate hollow body which is mounted at the discharge of any appropriate plant or machine (not shown). In the embodiment illustrated, a mounting bracket 4 is provided to connect the chute 2 to the machine. The end elevation of the chute (Figure 1B) illustrates that the chute is formed of two elongate, substantially U-shaped channel members 6. Each channel member 6 has two spaced sides 8 connected by a base 10, and the channel members 6 are arranged with their openings facing to give the chute 2 a substantially rectangular shaped cross-section. The bases 10 define two spaced end walls of the chute 2. Each side wall of the chute is defined by a respective side 8 of each channel member 6 together with a side plate 12. It will be seen that each side plate 12 is an elongate plate whose longitudinal edge regions are overlaid by corresponding longitudinal edge regions of the sides 8. It will also be apparent from Figure 1B that each side plate 12 is recessed to define an outwardly opening elongate channel 18 which extends longitudinally of each side of the chute 2. Towards their top, each channel member 6 carries a bracket 20 to which the rod of a single acting pneumatic cylinder 22 is connected. The body of each cylinder 22 is mounted on a bracket 24 depending from the mounting bracket 4.

Each side plate 12 is fixed to the support bracket 4. In addition, each side plate 12 is connected to the sides 8 of each of the channel members 6. In this respect, two elongate slots 26, inclined to the longitudinal axis of the chute 2, are provided in each side 8 of each channel member 6 and are arranged to receive a respective location pin, as 28, which projects from the side plate 12.

The chute 2 is shown in Figures 1A and 1B in its normal non-expanded position at the beginning of a packaging operation. In this position, a bag or other container with a closed end (not illustrated) is slipped over the chute 2. In this respect, the open bottom end 30 of the chute 2 defines a material discharge opening and the container is positioned to extend across the discharge opening 30 and close the opening. Further, the container is shaped and sized such that its peripheral surface surrounds the rectangular periphery of the chute over at least part of the length of the chute 2. The bag may be placed in position manually or by automatic means, and the open end of the bag, which encircles the chute at some distance above the discharge opening 30, is generally initially held in position. In a preferred embodiment, the container is a bag made of plastics material.

Where the material to be packaged is bulky it is preferably compacted and is then presented in a block to the open top of the chute 2. In this respect, the block has a similar rectangular cross-sectional shape to that of the chute but its dimensions are at least equal to, but preferably greater than, the corresponding dimensions of the chute transversely of the longitudinal extent of the chute.

The block is presented to the upper opening of the chute by appropriate means (not shown) and is then forced into and longitudinally of the chute 2 by way of a ram (not shown). The cylinders 22 are under pressure and thus urge the two channel members 6 of the chute towards each other. As the ram forces the material into and through the chute 2 the material has to expand the chute against the pressure applied by the cylinders 22. In this respect, the material is able to move the channel members 6 away from each other so that they move relative to the side plates 12. The movement of the channel members 6 is controlled by the downwardly inclined slots 26 and the projections 28, and so the channel members 6 move outwardly and downwardly to the fully expanded position of the chute shown in Figure 2. The pressure applied by the cylinders 22, against which the expansion of the chute takes place, is adjusted to ensure that the material within the chute is maintained at an even density.

It will be recalled that the bag in which the material is to be packaged is around the chute 2 and accordingly it is stretched by the expansion of the chute. The stretching of the material of the bag causes it to be held in position on the chute even though the ram continues to force material through the chute to the discharge opening. Furthermore, the resistance to stretching of the bag also acts as a constraining force resisting the expansion of the chute. It will be appreciated that the slots 26 and their corresponding projections 28 prevent expansion of the chute beyond the fully expanded position of Figure 2 and so the continued application of pressure to the material, and the fact that the discharge opening is closed by the bag causes the volume of the material to be reduced and thereby increases the force applied. This process continues until the force applied to the bag and to the increasingly compressed material is sufficient to push the bag off the chute. It will be appreciated that both the material and the bag are simultaneously pushed out of and off the chute such that the material is contained within the bag and constrained thereby.

As the bag is gripped by the chute air displaced thereby can exit through the channels 18 defined in the side plates 12. It will be appreciated that the ram head pushing the material into the chute 2 will eventually follow the material into the chute. This ram head also has a transverse dimension which is oversize as compared with the non-expanded dimension of the chute and generally the transverse dimension of the ram head is larger than that of a block of material. Accordingly, to enable the ram head to enter the chute easily the pressure applied by the cylinders 22 is released as the ram enters the chute. Furthermore, as the ram head is returned out of the chute to its initial position, the pressure to the cylinders 22 is recharged. The rods of the cylinders 22 then act to push the channel members 6 towards one another, and, as there is no longer material in the chute to oppose this action, the chute is returned to its initial non-expanded position.

Figure 3 shows a schematic of the hydraulic circuit for the single acting cylinders 22. This circuit comprises a pump 32 for pumping a liquid, for example, pressurised oil. When pressure is to be applied to the cylinders 22, a diverter valve 34 is set in its open position illustrated, and the system is charged using the pump 32. The system pressure is set by way of a pressure relief valve 38. The diverter valve 34 is then closed to maintain the system pressure. As the material is forced through the chute during packaging, pressure is applied to the cylinders 22 to try to close them against the system pressure and this maintains the density of the material. Any excess oil is absorbed by an accumulator 36.

In addition to the circuit illustrated, means (not shown) are provided to enable the system pressure to be dumped as the ram head enters the chute or the pressure in the chute becomes too great.

It will be appreciated that modifications and variations to the invention as described and illustrated herein may be made in accordance with the invention.

Claims

1. A method of packaging material comprising the steps of positioning a bag or other container with a closed end around a chute having a discharge opening such that said discharge opening is within the container, and forcing a quantity of material through said chute towards said discharge opening, wherein the material is arranged to expand the volume of said chute against a constraining force whereby the container is retained on the chute and the density of material within the chute determined.

2. A method as claimed in Claim 1, wherein said constraining force is a pressure applied to the chute to oppose its expansion, and the pressure is preset and/or adjustable such that the density of the material within the chute can be chosen.

3. A method as claimed in Claim 1 or 2, further comprising the step of continuing to force the material through the chute until the filled container is pushed off the chute.

4. A method as claimed in any preceding claim, wherein the step of forcing a quantity of material through the chute comprises pushing a block of material through the chute, said block

having a peripheral shape similar to that of the chute, and at least one dimension of said block being at least the same as, but preferably greater than, a corresponding dimension of the chute.

5. A method as claimed in any preceding claim, wherein the step of forcing a quantity of material through the chute comprises pushing a block of material through the chute by way of a ram having a ram head with at least one dimension, transverse to its direction of movement through the chute, which is greater than the corresponding transverse dimension of the chute in its non-expanded state.

6. A method as claimed in Claim 5, wherein as the ram head enters the chute, said constraining force is released.

7. A method as claimed in any preceding claim, wherein said constraining force is applied by hydraulically or pneumatically operated biasing means, and wherein the resistance to expansion of the container is also arranged to act as a constraining force.

8. A method of packaging material comprising the steps of positioning a bag around an elongate hollow chute having a discharge opening at one end such that the periphery of the bag surrounds the peripheral surface of the chute and the closed end of the bag extends across and closes the discharge opening, pushing a block of material through the chute towards said discharge opening and simultaneously applying a constraining force to said chute, a dimension of the block of material transverse to the longitudinal extent of the chute being greater than a corresponding transverse dimension of the chute such that pushing the material through the chute causes the expansion of said dimension of the chute against the action of the constraining force, and continuing to push the material until the bag containing the block of material is pushed off the chute.

9. A discharge chute (2) comprising a hollow body in which a discharge opening (30) is defined, wherein the hollow body is constructed from at least two wall members (6) arranged to have overlapping regions and to be movable relative to one another such that relative movement of the wall members away from each other can increase the volume of said hollow body.

10. A discharge chute as claimed in Claim 9, wherein said chute is an elongate hollow body, preferably substantially rectangular in cross-section, formed by two elongate channel members (6) which are substantially U-shaped in cross-section and are arranged with their openings facing, each said channel member having two spaced sides (8) interconnected by a base member (10), and wherein the channel members (6) are arranged such that their base members form two spaced end walls of the hollow body and their sides define respective extensible side walls of said hollow body.

11. A discharge chute as claimed in Claim 10, wherein each side of one channel member (6) is in overlapping arrangement with a corresponding side of the other channel member (6), thereby defining a respective side wall of the chute which may be extended by moving the channel members away from each other.

12. A discharge chute as claimed in Claim 10, wherein each side wall of the hollow body is defined by a side plate (12) interposed between a respective side (8) of each channel member (6), part of each side (8) of each channel member overlying said side plate (12), movement of the channel members away from each other being arranged to cause extension of each side wall by movement of the two coresponding sides of the channel members away from each other.

13. A discharge chute as claimed in any of Claims 9 to 12, wherein the overlapping wall regions of the hollow body are connected together by connecting means (26, 28) arranged to control the volume increase of the chute (2).

14. A discharge chute as claimed in Claim 13, wherein said connecting means comprise an inclined elongate slot (26) in one of said overlapping wall regions and a corresponding projection (28) protruding from the other of said wall regions and engaged in the slot for movement therealong.

15. Apparatus for packaging material comprising a chute (2) having a discharge opening (30) arranged such that a bag or other container with a closed end can be positioned around the chute with the discharge opening within the container, and means for pushing material through the chute to said discharge opening, wherein the chute is constructed such that its volume can be expanded, and further comprising force applying means (22) arranged to apply a constraining force to said chute.

16. Apparatus as claimed in Claim 15, wherein said means for pushing material through the chute (2) comprises a ram.

17. Apparatus as claimed in Claims 15 or 16, wherein said force applying means comprises hydraulically or pneumatically operated biasing means (22), for example one or more hydraulic cylinders.

18. Apparatus as claimed in any of Claims 15 to 17, wherein said chute is a discharge chute as claimed in any of Claims 9 to 14.

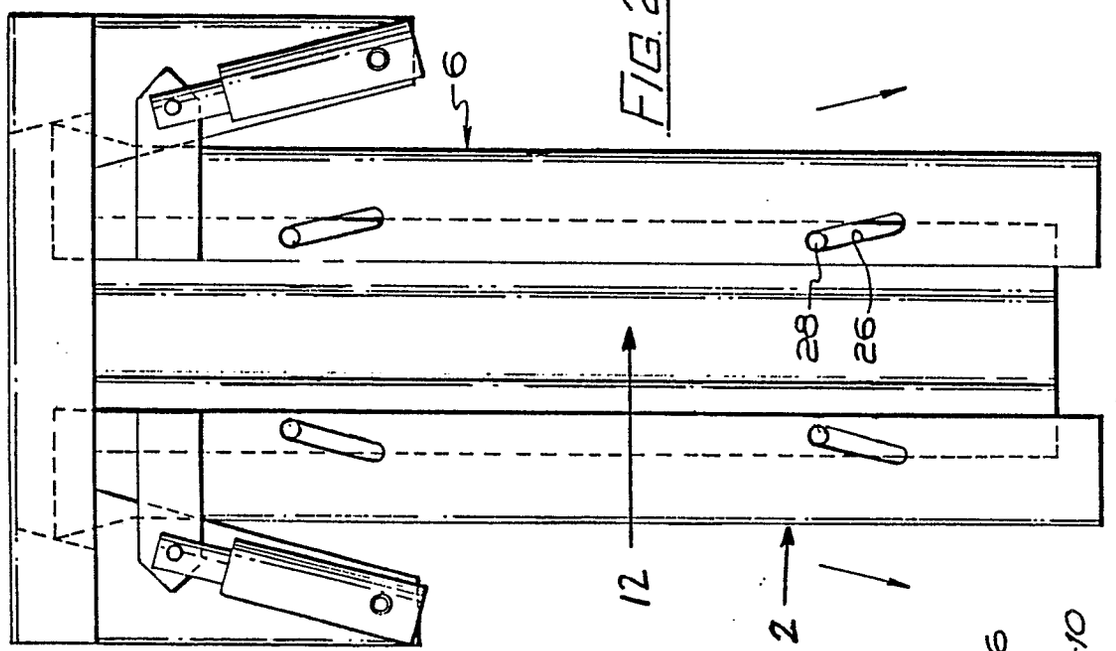

FIG. 2.

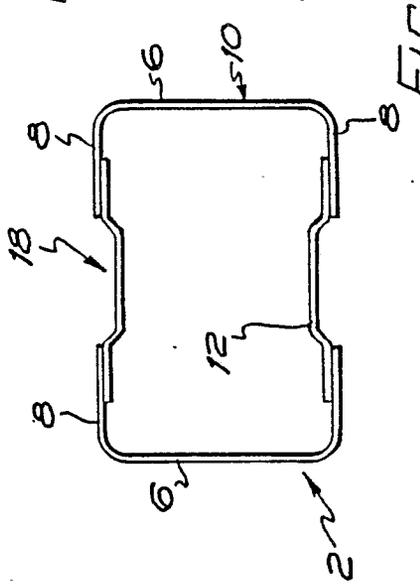

FIG. 1B.

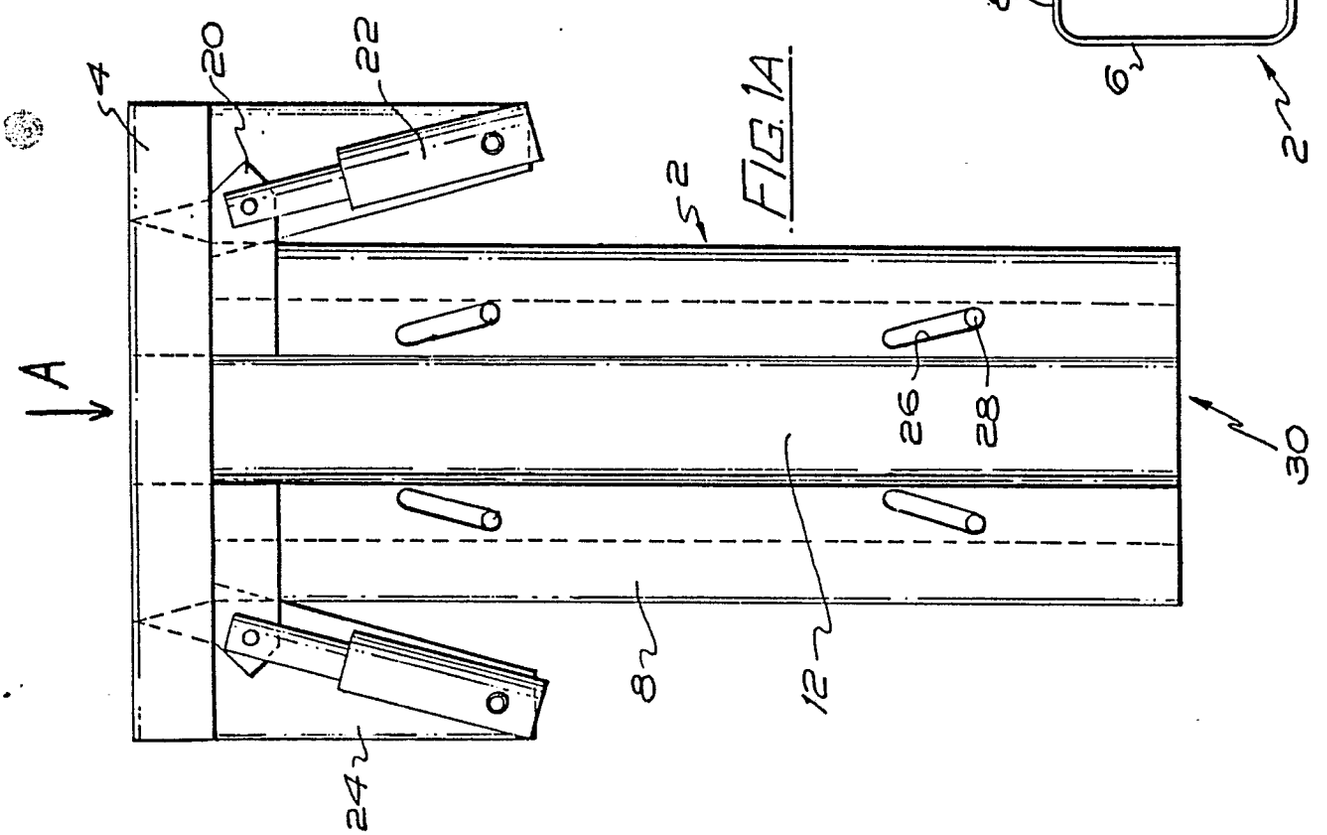

FIG. 1A.

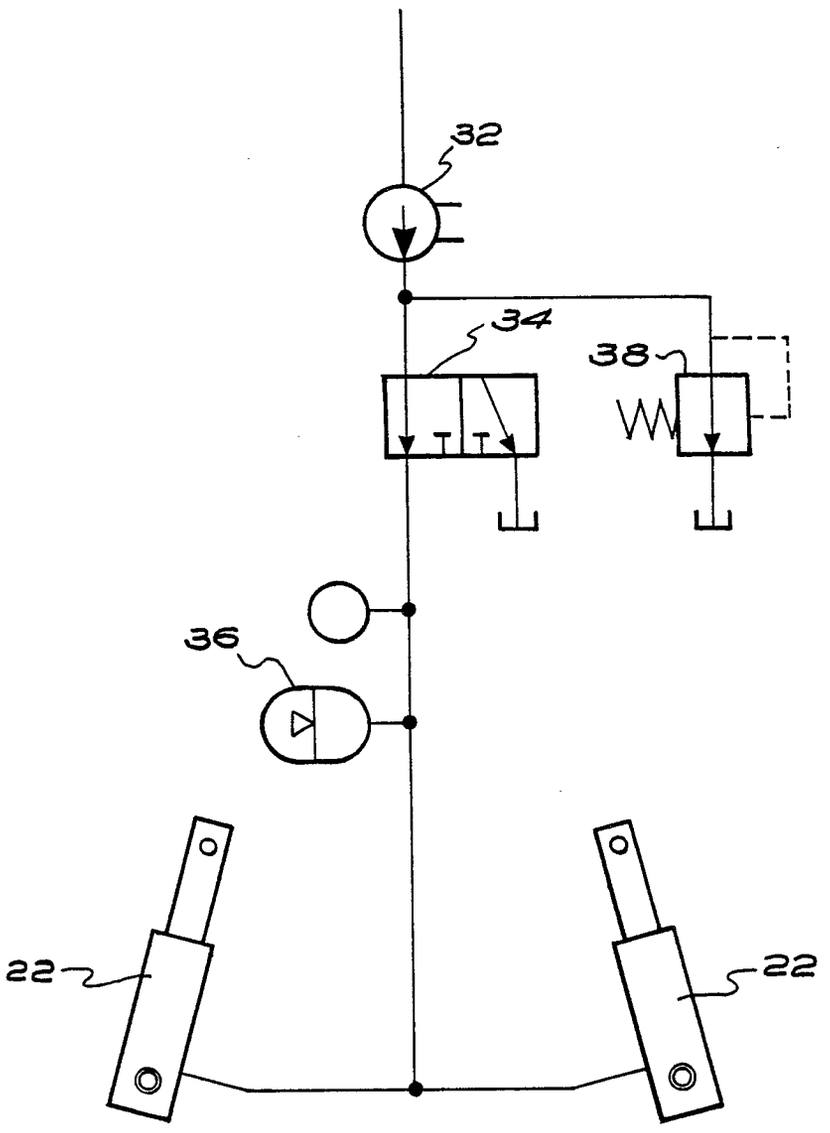

FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 30 6428

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 Y	US-A-3 011 297 (J. McDEVITT) * Column 3, lines 12-49; figures *	1-4,7,8,15,17 5,6,16	B 65 B 39/02 B 30 B 11/22
X	FR-A-2 375 096 (ANVAR) * Page 4, line 7 - page 5, line 8; figure 9; claims 2,3 *	1,2,4,9,10,12,15,18	
X	US-A-2 865 157 (W. TALSMA) * Column 2, lines 2-67; figures *	1,3,4,9,11,13,14	
Y	FR-A-2 236 730 (W. GRACE) * Page 2, line 6 - page 3, line 7; figures *	5,6,16	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 B
B 30 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03-10-1989	JAGUSIAK A.H.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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