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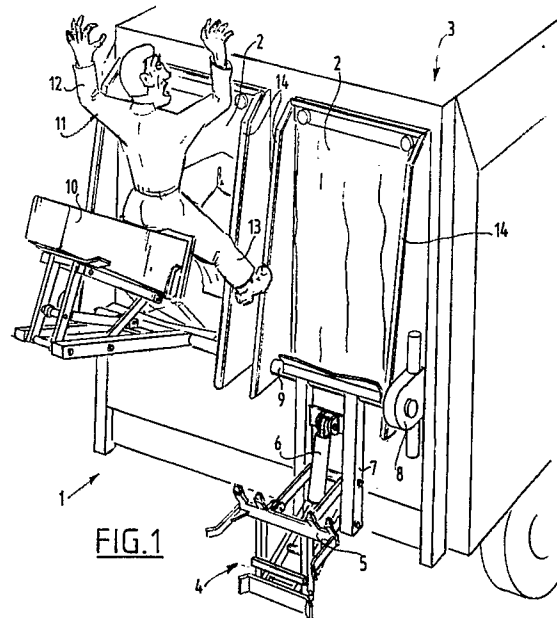
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54 **Transport vehicle with a container unloading device.**

57 Transport vehicle (1) with a loading space provided with a loading opening (2) and a container unloading device (4) which comprises a lifting device for picking up a container (10) and raising thereof to the loading opening, wherein the lifting device has a hydraulic driving controlled by an electro-hydraulic control device. Along at least a portion of the edge of the loading opening (2) is arranged a pressure-sensitive switching member (14) which is coupled to the control device such that at activation thereof the hydraulic driving of the lifting device is switched off.



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TRANSPORT VEHICLE WITH A CONTAINER UNLOADING DEVICE

The invention relates to a transport vehicle with a loading space provided with a loading opening and a container unloading device which comprises a lifting device for picking up a container and raising thereof to the loading opening, wherein the lifting device has a hydraulic driving controlled by an electro-hydraulic control device.

An example of such a transport vehicle is a generally known refuse collection truck. Household or industrial waste is collected in containers which are emptied regularly using a transport vehicle as described above. The container is therein picked up by the lifting device and the contents thereof are carried via the loading opening into the loading space of the transport vehicle.

The lifting device forms a potential danger for the operatives and other persons in the vicinity of the transport vehicle when it is in operation for emptying containers. Inattentive persons could be taken hold of by the lifting device and be carried through the loading opening into the loading space. This entails very great risk of at least serious injury. Particularly when the container unloading device functions automatically, that is, the cycle of movement of the lifting device runs automatically after a starting command has been given, it is not certain that an operative can intervene in time to stop the lifting device.

The invention therefore has for its object to provide a transport vehicle of the type specified in the preamble which is safeguarded such that normally speaking no persons can be pushed by the lifting device into the loading space. Of importance herein is that the user-friendliness of the device is not reduced since in practice there would then be the risk that the safety device would be switched off. The safety device must therefore prevent with a probability bordering on certainty that people can be moved through the loading opening, while no obstruction may be imposed on the movement of any random object through the loading opening.

With a transport vehicle according to the invention the above specified object is achieved in that along at least a portion of the edge of the loading opening is arranged a pressure-sensitive switching member which is coupled to the control device such that at activation thereof the hydraulic driving of the lifting device is switched off. The loading opening hereby remains entirely free for passage of containers and objects tipped out of these containers. Since it is to be expected that persons taken hold of by the lifting device will attempt in a reflex to stop themselves against the edge of the loading opening when they are being moved towards the loading opening, the pressure-sensitive

switching member will in that case be activated and the hydraulic driving of the lifting device switched off. The safety device according to the invention has no influence whatever on the normal operation of the device. On the contrary, it provides the additional advantage an extra protection against the processing of containers having objects protruding too far which could cause damage to the device and/or the container. When moving towards the loading opening, the objects protruding too far will also activate the pressure-sensitive switching member along the edge of the loading opening so that the lifting device is switched off before damage is caused.

The invention is of particular value in a transport vehicle which has a pressing device in the loading space. If a person is carried into the loading space of such a transport vehicle the consequences will virtually always be fatal. The embodiment of the invention as characterized in claim 2 is therefore preferably applied. Even if a person gripped by the lifting device is still carried wholly or partially, for instance with an arm or leg, through the loading opening into the loading space after activating of the pressure-sensitive switching member and consequent stopping of the lifting device, there is still no danger of injury or worse.

An operationally safe embodiment of the invention is characterized in claim 3.

It has been found that the switching member as characterized in claim 4 combines a very reliable operation with a great sensitivity and a long useful life. By applying this step an optimally safeguarded transport vehicle is thus obtained.

The invention will be further elucidated in the following description with reference to the annexed figures.

Fig. 1 is a partly perspective rear view of a transport vehicle according to the invention.

Fig. 2 is a partly sectional perspective view of a preferred embodiment of a switching member for use in the invention.

Fig. 3 shows a connection diagram of the hydraulic driving of a transport vehicle according to the invention.

The vehicle 1 depicted partially in fig. 1 is a transport vehicle specially equipped for transporting waste. Vehicle 1 comprises a load container 3 in which a loading space is defined. In the embodiment of the vehicle shown the load container is provided with two loading openings 2 giving access to the loading space.

Mounted close to each loading opening is a container unloading device 4. This container unloading device 4 comprises a lifting device where-

with a container 10 can be picked up and moved to the loading opening 2 for tipping the contents of the container 10 into the loading space. The lifting device comprises a carrier 5 having on the upper edge a comb-like gripping member which can grip behind a rim close to the top of the container 10. The carrier 5 is mounted for upward movement to a swivel frame 7 by means of two arms. This swivel frame 7 comprises a shaft 9 which is mounted rotatably under the loading opening 2 and which can be rotated about its longitudinal axis by a swivel cylinder 8.

When a container 10 is picked up the cylinder 6 is first activated whereby the holder 5 with the container 10 is moved upward. When the cylinder 6 is wholly retracted the swivel cylinder 8 becomes active and the assembly swivelled about the shaft 9, wherein the opening of the container 10 is placed close to or partially into the loading opening 2 so that the container 10 can be emptied.

The transport vehicle thus far described is per se known and in general use.

According to the invention the transport vehicle 1 comprises a safety device which provides that the lifting device is switched off when a person 11 taken hold of thereby is in danger of being pushed through the loading opening 2 into the loading space. According to the invention, along a portion of the edge of the loading opening, in the embodiment shown namely along the vertical side edges and along the top edge, is arranged a pressure-sensitive switching member 14 which in a manner to be further described is coupled to the control device for the hydraulic driving of the container unloading device such that when this switching member is activated the driving of the lifting device is immediately switched off. The invention assumes here that a person 11 taken hold of by the lifting device will attempt in a reflex to stop himself against the edge of the loading opening 2 with his arms 12 and/or legs 13. The switching member 14 is therein automatically activated, whereby the movement of the lifting device thus stops immediately.

Fig. 2 shows in more detail a preferred embodiment of the pressure-sensitive switching member 14.

This switching member 14 is a commercially available switching strip which comprises an aluminium mounting profile 15 in which is arranged a rubber profile 16 that defines a lengthwise hollow 17. Accommodated in this lengthwise hollow is an electrode assembly 18, 19. The electrode 19 is a flexible profile with a semi-circular section of electrically conducting material. Arranged in the interior of the electrode 19 is a strip-form electrode 18 which is fixedly connected by an insulating layer 20 to the flat side of the electrode 19. When a

force is exerted on the rubber profile 16 as indicated with arrow 21, the rubber profile 16 and the semi-circular wall of the electrode 19 will be pressed in. The semi-circular electrode 19 therein comes into contact with the strip-form electrode 18 so that an electrical circuit, connected to the electrode 18 and 19 and effecting the desired switch off action of the hydraulic driving, is closed.

Fig. 3 shows schematically a hydraulic connection diagram for the container unloading device shown in fig. 1.

In fig. 3 can be seen the pulling cylinder 6 and the swivel cylinder 8 shown in fig. 1. These can be fed with oil under pressure from a feed line 22. The oil under pressure is delivered by a pump (not shown) which is connected to the motor of vehicle 1.

The oil under pressure from feed line 22 is fed via line 27 to the cylinders 6 and 8. The valve 25 is placed for this purpose in the position moved to the left relative to fig. 3. The construction of the lifting device is such that the load on the cylinder 6 is smaller than that on the cylinder 8 so that when oil under pressure is supplied the cylinder 6 is first retracted, wherein the carrier 5 moves upward, and as soon as the cylinder 6 is moved fully upward the cylinder 8 is activated in order to swivel the whole assembly upward. Downward swivelling after emptying of the container takes place in reverse sequence, wherein the three-way valve 25 is moved to the right as seen in fig. 3 so that the hydraulic oil can flow out of the cylinders 8 and 6 in this order to the reservoir 32. The cylinders 6 and 8 can move back under the influence of the weight of the lifting device or, if desired, using springs arranged on the device.

Operation of the valve 25 in the manner just described takes place by feeding oil under pressure via the control lines 26 to one of the two sides of the valve. This can be performed with the three-way valve 23 which is electrically activated by an electrical part of the control device which is not further described or by a manually operated valve 24. This control is per se known and is therefore not elucidated here more at length. The hydraulic device further comprises a main valve 28 which on the one hand acts as pressure limiting valve and on the other can be opened to make the line 27 pressureless and thereby immediately stop the feed of oil under pressure to the cylinders 6 and 8. The main valve 28 is held closed up to a determined pressure, which pressure is determined by the control pressure in the control line 29 connected to the valve 28. This control line 29 is connected via a two-way valve 30 to the line 31 in which the reservoir pressure prevails. The two-way valve 30 can be operated electrically and is activated during normal operation so that the valve 30

is kept in the position moved downward relative to the position in fig. 3 and wherein the bypass line is closed. By interrupting exciting of the valve 30 the bypass line is opened whereby the control line 29 becomes pressureless and the main valve 28 opens, so that all oil under pressure flows away via the line 31 to the reservoir. A possible circuiting of the exciter coil of the valve 30 is likewise shown in fig. 3.

In the control circuit a normally closed contact pair of a relay 33 and a normally opened contact pair of a relay 34 are arranged in series. The relay 34 is excited by operating the pressure switch 35, whereafter the contact pair of the relay 34 closes and the relay 34 thus keeps itself excited. In this situation the two-way valve 30 is excited, the main valve 28 is normally closed and oil under pressure can therefore be fed via the line 27 to the cylinders 6 and 8.

When now the switching strip is activated and the contacts 18 and 19 are closed, the relay 33 is activated whereby the normally closed contact pair thereof is opened. Due to the opening of this contact pair the exciting falls away from both valve 30 and relay 34. The valve 30 is thereby displaced into the position shown in fig. 3, whereby the control line 29 of the valve 28 becomes pressureless, thus opening main valve 28. The oil pressure in line 27 falls away immediately and through the action of the one-way valve 36 the cylinders 6 and 8 stand still in the position reached. Only after pressing in the press-button 35 again does the system become active.

The control system can of course contain further safety devices. The possibility can for instance be incorporated that the cylinders 6 and 8, after switching off by activation of the pressure strip 14, are first returned to their lowest position using the hand control 24 before the automatic control can be switched on again. Such additional safeguards fall however outside the scope of this patent application.

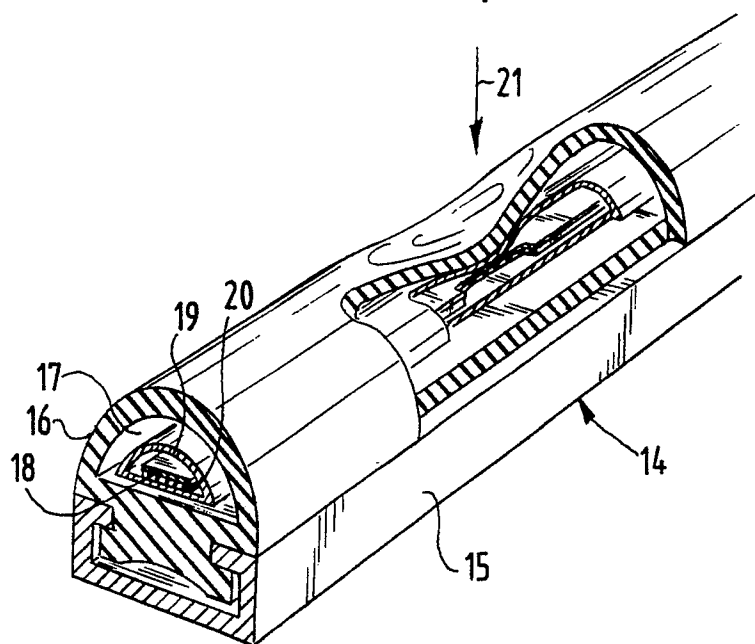
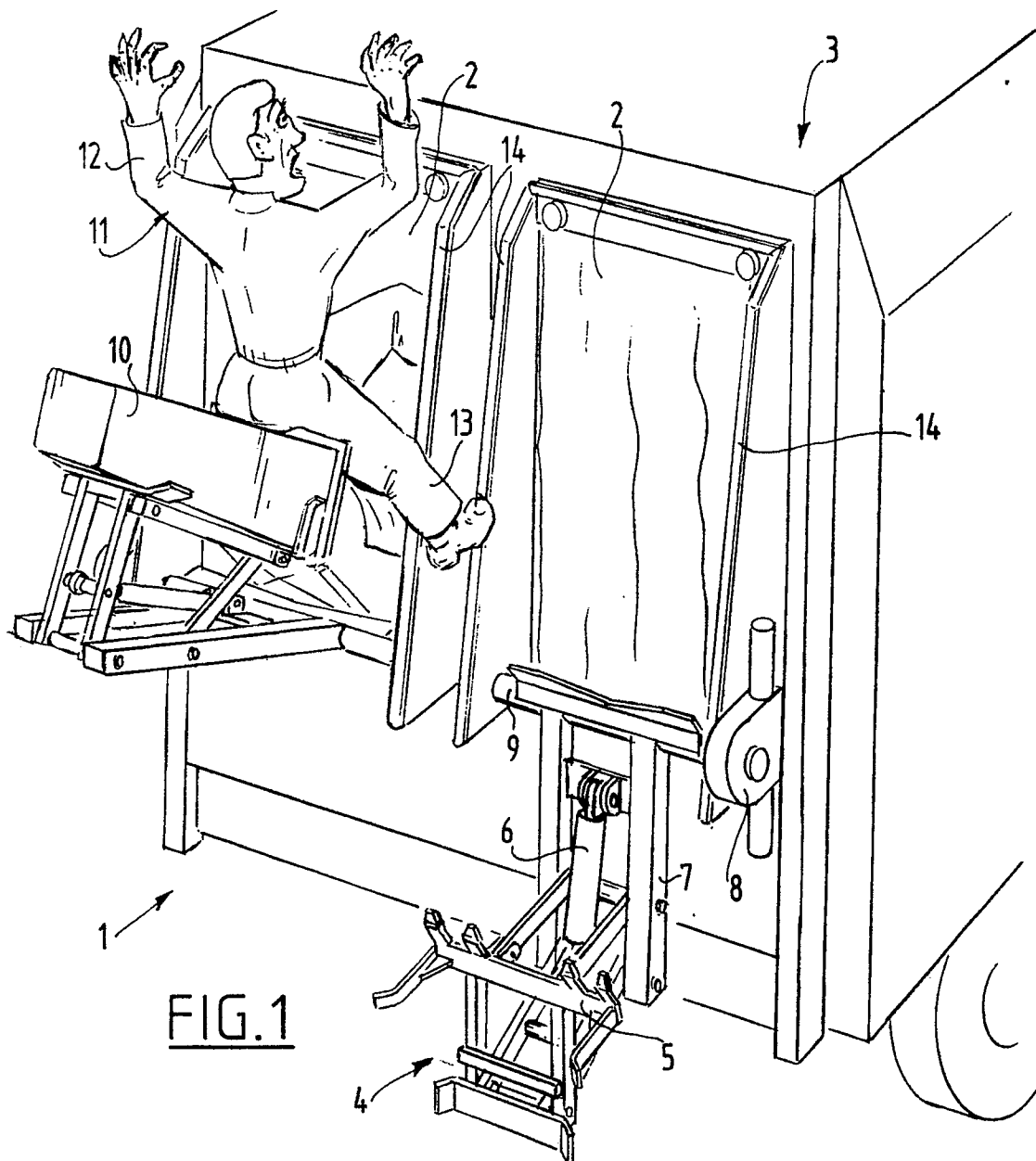
The switch off signal generated by activating the switching member 14 can also be used in further self-evident manner for switching off other hydraulic systems of the transport vehicle 1, particularly for switching off a press device that may be present in the loading space of transport vehicle 1.

Although the switching strip for use in the invention shown in detail in fig. 2 is preferred, within the scope of the invention pressure-sensitive switching members in another embodiment can of course also be arranged along at least a portion of the edge of the loading opening.

The invention can be used with any type of transport vehicle with any type of container unloading device.

Claims

1. Transport vehicle with a loading space provided with a loading opening and a container unloading device which comprises a lifting device for picking up a container and raising thereof to the loading opening, wherein the lifting device has a hydraulic driving controlled by an electro-hydraulic control device, **characterized in that** along at least a portion of the edge of the loading opening is arranged a pressure-sensitive switching member which is coupled to the control device such that at activation thereof the hydraulic driving of the lifting device is switched off.
2. Transport vehicle as claimed in claim 1, **characterized in that** arranged in the loading space is a press device with a hydraulic driving coupled to the control device and that at activation of the switching member the hydraulic driving of the press device is likewise switched off.
3. Transport vehicle as claimed in claim 1 or 2, **characterized in that** at activation of the switching member the control device opens a bypass valve connected between the inlet and the outlet of a hydraulic pump of the hydraulic driving.
4. Transport vehicle as claimed in any of the foregoing claims, **characterized in that** the switching member comprises hollow profile material of an elastomer material in the interior whereof two electrically conducting elements are arranged supported at a mutual interval and that when the profile is pressed in the conducting elements are brought into conducting connection with one another.



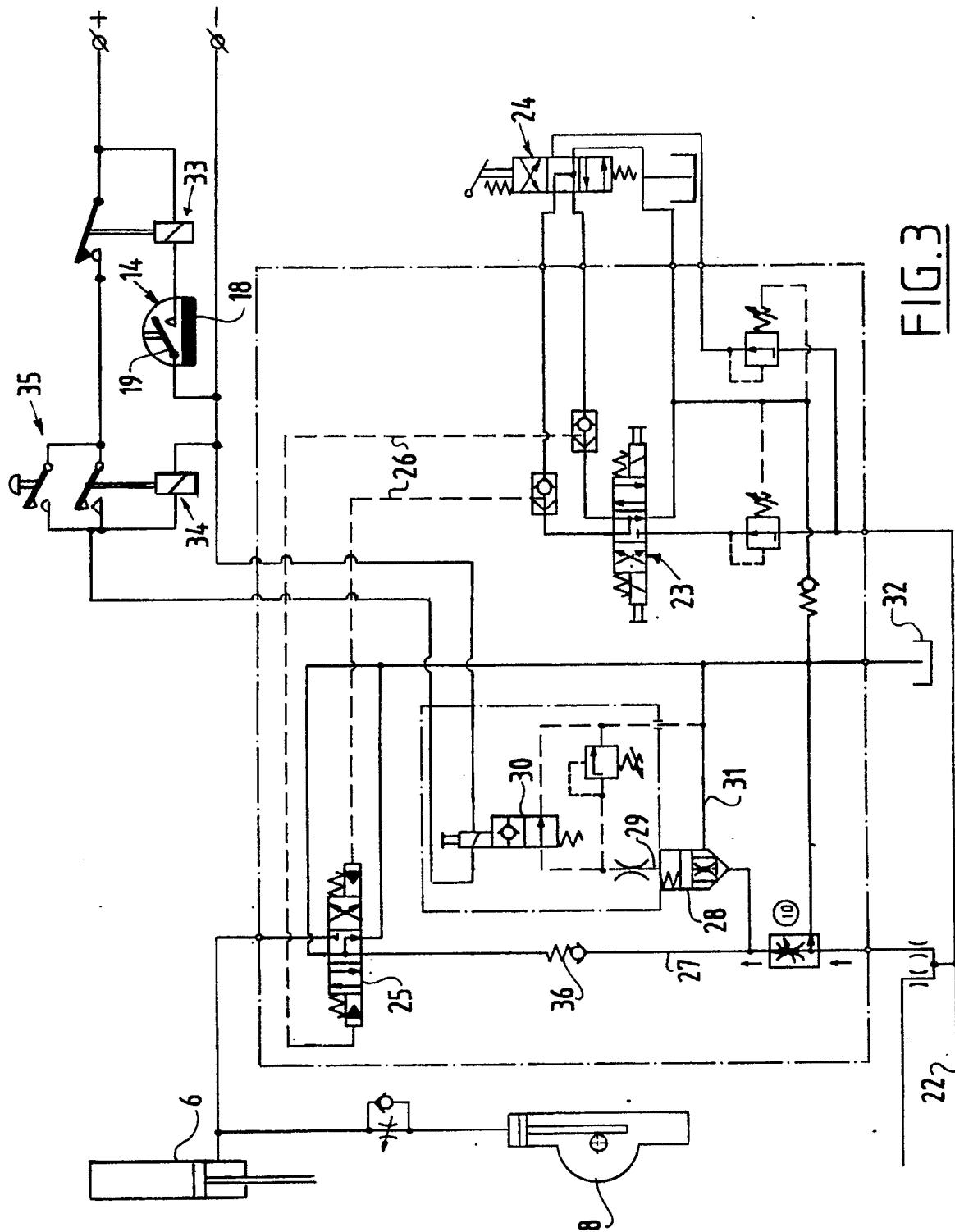


FIG. 3



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EUROPEAN SEARCH REPORT

Application Number

EP 90 20 2209

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)
Y	US-A-3 809 267 (KNIGHT) * Figures 3,4; column 3, lines 7-30 * ---	1-4	B 65 F 3/00 H 01 H 3/14
Y	US-A-3 942 661 (CLUCKER et al.) * Figures 7,8,10; column 6, line 58 - column 7, line 28 * ---	1-4	
Y	FR-A-2 173 306 (CLIFFORD COVERING CO.) * Figures 1,2; claim 1 * ---	4	
A	US-A-3 822 797 (McKENZIE et al.) ---		
A	DE-A-2 300 574 (KÖLLER) ---		
A	DE-A-2 721 059 (KÜPPER) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 F H 01 H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17-10-1990	Examiner DEUTSCH J.P.M.
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			