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(54) **ESCAPE LADDER**

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to an escape apparatus. More particularly, the present invention relates to an escape apparatus for enabling occupants of a building on fire to escape.

BACKGROUND OF THE INVENTION

[0002] Although there are many systems in the marketplace for enabling persons to evacuate from a building on fire, existing systems all have associated problems.

[0003] GB 2222848 describes a fire escape apparatus which uses an extendable rope-type ladder. The extendable ladder simply drops down from a retaining box. The extended ladder has many problems such as when the ladder has been used, although the ladder can be rewound, this has to be done by a professional. Otherwise, the ladder during the next operation, may simply snag and not fully extend. Therefore, similar to a parachute opening, the ladder system in GB 2222848 requires a suitably qualified professional to replace the ladder once extended.

[0004] Furthermore, more traditional fire escapes rely on a permanent ladder system located on the outside of a building. However, such ladder systems increase the risk of burglars entering a building by providing ready access to upper stories.

[0005] WO 0040831-A1 discloses an escape apparatus according to the preamble of claim 1.

[0006] Additionally, although other safety ladders and stairways exist, these can be difficult to erect thereby wasting valuable time when attempting to rescue people in a burning building. It has been found that if occupants are not retrieved from a burning building within four to five minutes, then their chances of surviving are significantly decreased.

[0007] It is an object of at least one aspect of the present invention to obviate or mitigate at least one or more of the aforementioned problems.

[0008] It is a further object of at least one aspect of the present invention to provide an escape apparatus which is easy and safe to use.

SUMMARY OF THE INVENTION

[0009] According to the present invention there is provided an escape apparatus according to claim 1.

[0010] The escape apparatus may be located on the outside of a building. For example, the escape apparatus may be located on the outside of commercial dwellings and residencies (e.g. hotels, boarding houses, hostels, nursing homes), offices, shops, factories, mills, warehouses, etc. In the event of a fire, the escape apparatus may be activated to enable occupants of such a building to evacuate.

[0011] The extendable ladder may comprise any appropriate number of steps to enable the ladder to extend to a floor situated below. The extendable ladder therefore has at least one or more or a plurality of steps as required.

The steps may be interconnected to one another with a flexible linkage such as a rope, steel wires or a fibrous material. The flexible linkage may extend through both sides of each step.

[0012] Typically, the pivoting mechanism allows the steps to move substantially up or down. The pivoting mechanism operates in a substantially scissor-like configuration. It comprises an upper and lower portion connected with a hinge. The upper and lower portion pivot around the hinge in a scissor-like action. As the hinge opens allowing the ends of the upper and lower portion to move away from each other, the steps extend from a closed position to an open position. A spring biases the upper and lower portions into a closed position.

[0013] The escape apparatus may comprise a pulley system which may be activated to allow the steps to extend in a concertina arrangement. By activating the pulley system, the flexible linkage extending through the steps may extend downwards thereby allowing the pivoting mechanism to expand from a first to a second configuration thereby allowing the steps to form a ladder extending to ground level. The flexible linkage enables the different steps in the escape apparatus to extend smoothly without any danger of snagging and not fully extending. Prior art systems require safety professionals to store ladder systems after they have been used to prevent any snagging of these systems when they are re-used. The pulley system may comprise a motor, a gearbox and a drive coupling. The motor may be activated manually by a person wishing to use the escape ladder system. Alternatively, the escape ladder mechanism may be activated automatically by a sensor detecting a fire such as a heat and/or smoke detector.

[0014] The steps may also comprise at least one spacer element. The spacer element may allow the steps to be located a small distance such as about 10 to 30 cms from a wall. The spacer elements may therefore facilitate the movement of a person down the ladder. If the ladder is in too close proximity to the wall, then a person descending down the ladder may scrape their hands and body against the wall.

[0015] The escape apparatus may also comprise handles to facilitate an occupant climbing out of a window of a building and to facilitate the person climbing down the ladder.

[0016] The escape apparatus may be connected to a wall using any suitable bracket type system. The escape apparatus may be located at any point on the outside or a building such as next to a window.

[0017] The escape apparatus may also comprise an inertia reel. Typically, the inertia reel is of a standard type and may be intended to allow small children to evacuate the building along with an adult using the escape apparatus. A child placed in the inertia reel may simply de-

scend using their own weight. Once the child has left the inertia reel, the inertia reel may simply rewind back to its original position at the top of the escape apparatus. The inertia reel mechanism may also comprise a seating area or harness on which a child may sit.

[0018] The escape apparatus may also allow a third party to climb up the escape ladder in the event that occupants of a building have not been able to evacuate a building on fire.

[0019] The escape apparatus may be controlled using a control panel. The control panel may be connected to sensors which may activate on detection of fire, carbon monoxide, smoke and/or heat. In the event that any of fire, carbon monoxide, smoke and/or heat are detected, an alarm may activate on the control panel. The control panel may comprise an override button to deactivate the system. However, in the event that the override button is not pressed, the full alarm system will be activated and the ladder may automatically descend. The control panel may also telephone emergency services and/or other predetermined telephone numbers such as mobile phone numbers of residents. The control panel may also be connected to a camera system.

[0020] Once the escape apparatus has been used, the steps in the ladder may be returned to their original position by activating the motor and pulley system to re-coil the flexible linkage and return the pivoting mechanism to its unexpanded original configuration. This procedure may be repeated as many times as possible without the need of a safety professional as found with prior art devices.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a front view of an escape apparatus according to a first embodiment of the present invention;

Figure 2 is a side view of the escape apparatus shown in Figure 1;

Figure 3 is a perspective view of a step as used in the escape ladder shown in Figures 1 and 2;

Figures 4a - 4c represent a pivoting mechanism as used in the escape apparatus shown in Figures 1 and 2;

Figure 5 is a spring as used in the pivoting mechanism shown in Figures 4a - 4c;

Figure 6 is a schematic representation of an escape apparatus according to a second embodiment of the present invention; and

Figures 7a and 7b represent the escape apparatus shown in Figure 6 being activated.

DETAILED DESCRIPTION

[0022] Referring to Figure 1, there is a representation of an escape apparatus, generally designated 10. The escape apparatus 10 comprises a plurality of steps 12 mounted on a frame 14. The frame 14 comprises handrails 16 to facilitate a user exiting a building such as from a window and climbing down the escape apparatus 10.

[0023] As shown in Figure 1, the escape apparatus 10 comprises a pulley system 18 which is capable of moving the steps 12 of the escape apparatus 10 up and down.

[0024] Figure 2 is a side view of the escape apparatus 10. As shown in Figure 2, the escape apparatus 10 comprises substantially horizontally protruding members in the form of spacing elements 13 which prevent the steps 12 from abutting against the wall of a building.

[0025] Figure 3 is a perspective view of one of the steps 12. The step 12 comprises substantially 'U'-shaped portions 12a, 12b and apertures 29 for engaging with a pivoting mechanism 20.

[0026] The pivoting mechanism 20 is shown in Figures 4a - 4c. The pivoting mechanism 20 comprises a lower portion 22 and an upper portion 24 which are connected via a pin 25. The upper and lower portions 22, 24 may pivot about the pin 25. A spring 26 biases the upper and lower portions 22, 24 into a closed position. Figures 4a - 4c also show that at the end of the upper and lower portions 22, 24 there are pins 28, 30, respectively. The pins 28, 30 are insertable into apertures 29 in each of the steps 12 in the escape apparatus 10, and thereby enable the steps 12 to extend in a concertina arrangement.

[0027] The steps 12 and pivoting mechanism 20 are formed from any suitable metal, alloy, composite, plastics or wooden material.

[0028] Figure 5 is an expanded view of the spring 26 used to bias the upper and lower portions 22, 24 of the pivoting mechanism 20 into a closed position.

[0029] Figure 6 is a schematic representation of an escape apparatus 100 according to a further embodiment of the present invention. The escape apparatus 100 shown in Figure 6 shows the first step 112a in an extended position. The steps 112 may be lowered using pulleys 118.

[0030] The escape apparatus 100 is connected to a frame 114. The frame 114 comprises handrails 116. The frame 114 is attached to a wall of a building using any suitable bracket-like structure.

[0031] As shown in Figure 6, a pivoting mechanism 120 has allowed the first step 112a to be lowered. As the structure is further lowered, the next step 112b in line will then in a concertina arrangement extend into a second position. Thereafter, steps 112c, 112d, 112e, 112f extend sequentially.

[0032] Figure 6 also shows that there is a release mechanism 132. A motor 134 is connected to a reduction gearbox 136, which is connected to a drive coupling 138. The drive coupling 138 is connected via a clutch 140 to a shaft 142. A brake 144 is also provided to allow the

descending steps 112 to be stopped at any time. There is also a manual override 146.

[0033] Figure 6 shows that the steps 112a, 112b, 112c, 112d, 112e, 112f are interconnected at both sides with a flexible linkage such as a rope 127. The rope 127 is wound around the pulleys 118 which allows the steps 112a, 112b, 112c, 112d, 112e, 112f to be raised and lowered as many times as necessary. A safety professional is therefore not required to re-coil the system. Safety systems are required for other systems due to the danger of the systems snagging and not fully extending.

[0034] Figure 6 also shows that there is a beacon 148 which may be activated in the event that the escape apparatus 100 is activated. There is also a safety lamp 150 which provides illumination for persons descending the escape apparatus 100 in the dark.

[0035] A control panel 152 may control the operation of the escape apparatus 100. The control panel 152 comprises an open button 154 allowing the steps 112 to extend into an open position, an override button 156 to prevent the system from activating in the event of a false alarm, and a close button 158 allowing the steps 112 to easily be returned to their original position in a closed position. The steps 112 may therefore be easily lowered and raised.

[0036] The control panel 152 is also connected to an alarm system which may activate in the event of detectors detecting the presence of fire, carbon monoxide, smoke and/or heat.

[0037] The control panel 152 may also telephone the emergency services or predetermined telephone numbers such as residents of a home. The control panel 152 may also send text messages.

[0038] The system therefore has the advantageous feature that the escape apparatus 100 may be activated automatically in the event of a fire thereby facilitating occupants of a building on fire to quickly evacuate the building. The escape apparatus 100 therefore has the facility to activate itself. It has been found that in the event that occupants have not evacuated a building within 4 to 5 minutes of a fire, then their chances of surviving the fire are significantly decreased.

[0039] Although not shown in the escape apparatus 100, there may also be an inertia reel enabling an adult to descend on the escape apparatus 100 and a child to be placed in a seating area on the inertia reel and be easily lowered as the adult descends the escape apparatus 100.

[0040] Figures 7a and 7b represent the operation of the escape apparatus 100. On the pulling of a handle 170 an electrical connection to a solenoid 172 may be broken. As shown in Figure 7b once the electrical coupling to the solenoid 172 is broken, the escape apparatus 100 may be activated and extends away from the wall by rotating wheel 174.

[0041] Whilst specific embodiments of the invention have been described above, it will be appreciated that departures from the described embodiments may still fall

within the scope of the invention. For example, any suitable type of mechanism may be used to allow the steps to descend in a concertina arrangement. The steps may also be of any suitable size and shape. The escape apparatus may also comprise a platform onto which wheel-chairs may be placed.

Claims

1. An escape apparatus (10) comprising:
 - an extendable ladder capable of extending in a concertina arrangement;
 - said ladder comprising a plurality of steps (12) capable of moving substantially up or down on a pivoting mechanism (20), said plurality of steps (12) being extendable to ground level, the steps (12) extending in a concertina arrangement; the pivoting mechanism (20) operating in a substantially scissor-like configuration allowing the steps (12) to move from a contracted first configuration to an expanded second configuration wherein the pivoting mechanism (20) comprises a sprung-hinge arrangement (26), **characterised in that** said sprung-hinge arrangement (26) biases the pivoting mechanism (20) into the contracted first configuration and the steps (12) therefore into the contracted first configuration.
2. An escape apparatus (10) according to claim 1, wherein the plurality of steps (12) are interconnected with a flexible linkage (127).
3. An escape apparatus (10) according to any preceding claim, wherein the escape apparatus (10) comprises a pulley system (18) which allows steps (12) to move substantially up or down.
4. An escape apparatus (10) according to any preceding claim, wherein each step (12) comprises a spacer (13) which may be used to act as a spacer element between the steps (12) and a wall.
5. An escape apparatus (10) according to any preceding claim, wherein the escape apparatus (10) comprises an inertia reel.
6. An escape apparatus (10) according to claim 5, wherein the inertia reel is of a standard type and is intended to allow small children to evacuate a building along with an adult.
7. An escape apparatus (10) according to claim 5, wherein the inertia reel is used to allow a child to descend using their own weight.
8. An escape apparatus (10) according to any of claims

5 to 7, wherein the inertia reel comprises a seating area or harness on which a child may sit.

9. An escape apparatus (10) according to any preceding claim, wherein the escape apparatus (10) is controlled using a control panel (152) connected to sensors which automatically activate on detection of fire, carbon monoxide, smoke and/or heat.
10. An escape apparatus (10) according to any preceding claim, wherein the escape apparatus (10) comprises an override button (156) to deactivate the system.
11. An escape apparatus (10) according to any preceding claim, wherein in the event that the override button (156) is not pressed, the full alarm system will be activated and the ladder will automatically be activated to descend.
12. An escape apparatus (10) according to any preceding claim, wherein the escape apparatus (10) may be used as many times as required and the steps (12) returned to their original position by activating a motor (134) and pulley system (118) to re-coil the steps (12).

Patentansprüche

1. Fluchtvorrichtung (10), die aufweist:

eine ausziehbare Leiter, die sich in einer zusammenschiebbaren Anordnung ausziehen kann; wobei die Leiter eine Vielzahl von Stufen (12) aufweist, die sich im Wesentlichen nach oben oder nach unten an einem Drehmechanismus (20) bewegen können, wobei die Vielzahl der Stufen (12) bis zum Bodenniveau ausziehbar ist, wobei sich die Stufen (12) in einer zusammenschiebbaren Anordnung ausdehnen; wobei der Drehmechanismus (20) in einer im Wesentlichen scherenartigen Konfiguration funktioniert, die gestattet, dass sich die Stufen (12) aus einer zusammengezogenen ersten Konfiguration in eine expandierte zweite Konfiguration bewegen, wobei der Drehmechanismus (20) eine Federgelenkanordnung (26) aufweist, **dadurch gekennzeichnet, dass** die Federgelenkanordnung (26) den Drehmechanismus (20) in die zusammengezogene erste Konfiguration vorspannt und die Stufen (12) daher in die zusammengezogene erste Konfiguration.

2. Fluchtvorrichtung (10) nach Anspruch 1, bei der die Vielzahl der Stufen (12) mit einer flexiblen Verbindung (127) miteinander verbunden ist.

3. Fluchtvorrichtung (10) nach einem der vorhergehenden Ansprüche, bei der die Fluchtvorrichtung (10) ein Rollensystem (18) aufweist, das die Bewegung der Stufen (12) im Wesentlichen nach oben oder nach unten gestattet.

4. Fluchtvorrichtung (10) nach einem der vorhergehenden Ansprüche, bei der eine jede Stufe (12) ein Distanzstück (13) aufweist, das benutzt werden kann, um als ein Abstandselement zwischen den Stufen (12) und einer Wand zu wirken.

5. Fluchtvorrichtung (10) nach einem der vorhergehenden Ansprüche, bei der die Fluchtvorrichtung (10) ein Rollgurt ist.

6. Fluchtvorrichtung (10) nach Anspruch 5, bei der der Rollgurt in Standardausführung vorliegt und dazu gedacht ist, dass die Evakuierung von kleinen Kindern aus einem Gebäude zusammen mit einem Erwachsenen gestattet wird.

7. Fluchtvorrichtung (10) nach Anspruch 5, bei der der Rollgurt benutzt wird, um zu gestatten, dass ein Kind durch Ausnutzung des eigenen Gewichtes nach unten gelangt.

8. Fluchtvorrichtung (10) nach einem der Ansprüche 5 bis 7, bei der der Rollgurt eine Sitzfläche oder ein Gurtwerk aufweist, auf der ein Kind sitzen kann.

9. Fluchtvorrichtung (10) nach einem der vorhergehenden Ansprüche, bei der die Fluchtvorrichtung (10) bei Benutzung einer Schalttafel (152) gesteuert wird, die mit Sensoren verbunden ist, die sich bei Nachweis von Feuer, Kohlenmonoxid, Rauch und/oder Wärme automatisch aktivieren.

10. Fluchtvorrichtung (10) nach einem der vorhergehenden Ansprüche, bei der die Fluchtvorrichtung (10) einen Übersteuerungsknopf (156) aufweist, um das System zu deaktivieren.

11. Fluchtvorrichtung (10) nach einem der vorhergehenden Ansprüche, bei der in dem Fall, dass der Übersteuerungsknopf (156) nicht gedrückt wird, das vollständige Alarmsystem aktiviert wird und die Leiter automatisch aktiviert wird, um nach unten zu gelangen.

12. Fluchtvorrichtung (10) nach einem der vorhergehenden Ansprüche, bei der die Fluchtvorrichtung (10) so viele Male benutzt werden kann, wie es erforderlich ist, und die Stufen (12) in ihre Ausgangsposition zurückgeführt werden, indem ein Motor (134) und das Rollensystem (118) aktiviert werden, um die Stufen (12) zurückzubringen.

Revendications

1. Dispositif d'évacuation (10), comprenant :

une échelle extensible, capable de s'étendre dans un agencement en accordéon ; ladite échelle comprenant plusieurs marches (12), pouvant se déplacer essentiellement vers le haut ou vers le bas sur un mécanisme pivotant (20), lesdites plusieurs marches (12) pouvant être étendues jusqu'au niveau du sol, les marches (12) s'étendant dans un agencement en accordéon ; le mécanisme pivotant (20) fonctionnant dans une configuration pratiquement en ciseaux, permettant le déplacement des marches (12) d'une première configuration contractée vers une deuxième configuration étendue, le mécanisme de pivotement (20) comprenant un agencement à charnière élastique (26), **caractérisé en ce que** ledit agencement à charnière élastique (26) pousse le mécanisme pivotant (20) dans la première configuration contractée et donc les marches (12) dans la première configuration contractée.

2. Dispositif d'évacuation (10) selon la revendication 1, dans lequel les plusieurs marches (12) sont interconnectées par un moyen de liaison flexible (127).

3. Dispositif d'évacuation (10) selon l'une quelconque des revendications précédentes, dans lequel le dispositif d'évacuation (10) comprend un système de poulie (18), permettant le déplacement des marches (12) essentiellement vers le haut ou vers le bas.

4. Dispositif d'évacuation (10) selon l'une quelconque des revendications précédentes, dans lequel chaque marche (12) comprend un moyen d'espacement (13) pouvant servir d'élément d'espacement entre les marches (12) et un mur.

5. Dispositif d'évacuation (10) selon l'une quelconque des revendications précédentes, dans lequel le dispositif d'évacuation (10) comprend un enrouleur à inertie.

6. Dispositif d'évacuation (10) selon la revendication 5, dans lequel l'enrouleur à inertie est du type standard et est destiné à permettre l'évacuation d'enfants en bas âge d'un immeuble, ensemble avec un adulte.

7. Dispositif d'évacuation (120) selon la revendication 5, dans lequel l'enrouleur à inertie sert à permettre la descente d'un enfant par l'intermédiaire de son propre poids.

8. Dispositif d'évacuation (10) selon l'une quelconque des revendications 5 à 7, dans lequel l'enrouleur à

inertie comprend une surface d'assise ou un harnais sur lequel un enfant peut s'asseoir.

9. Dispositif d'évacuation (10) selon l'une quelconque des revendications précédentes, dans lequel le dispositif d'évacuation (10) est contrôlé par un panneau de commande (152) connecté à des capteurs actionnés automatiquement lors de la détection d'un incendie, de monoxyde de carbone, de fumée et/ou de chaleur.

10. Dispositif d'évacuation (10) selon l'une quelconque des revendications précédentes, dans lequel le dispositif d'évacuation (10) comprend un bouton poussoir de priorité (156) pour désactiver le système.

11. Dispositif d'évacuation (10) selon l'une quelconque des revendications précédentes, dans lequel, au cas où le bouton poussoir de priorité (15) ne serait pas enfoncé, le système d'alarme complet est activé, l'échelle étant automatiquement actionnée en vue de la descente.

12. Dispositif d'évacuation (10) selon l'une quelconque des revendications précédentes, dans lequel le dispositif d'évacuation (10) peut être utilisé le nombre de fois voulu, les marches (12) étant ramenées vers leur position originale par actionnement d'un moteur (134) et d'un système de poulie (118) pour réenrouler les marches (12).

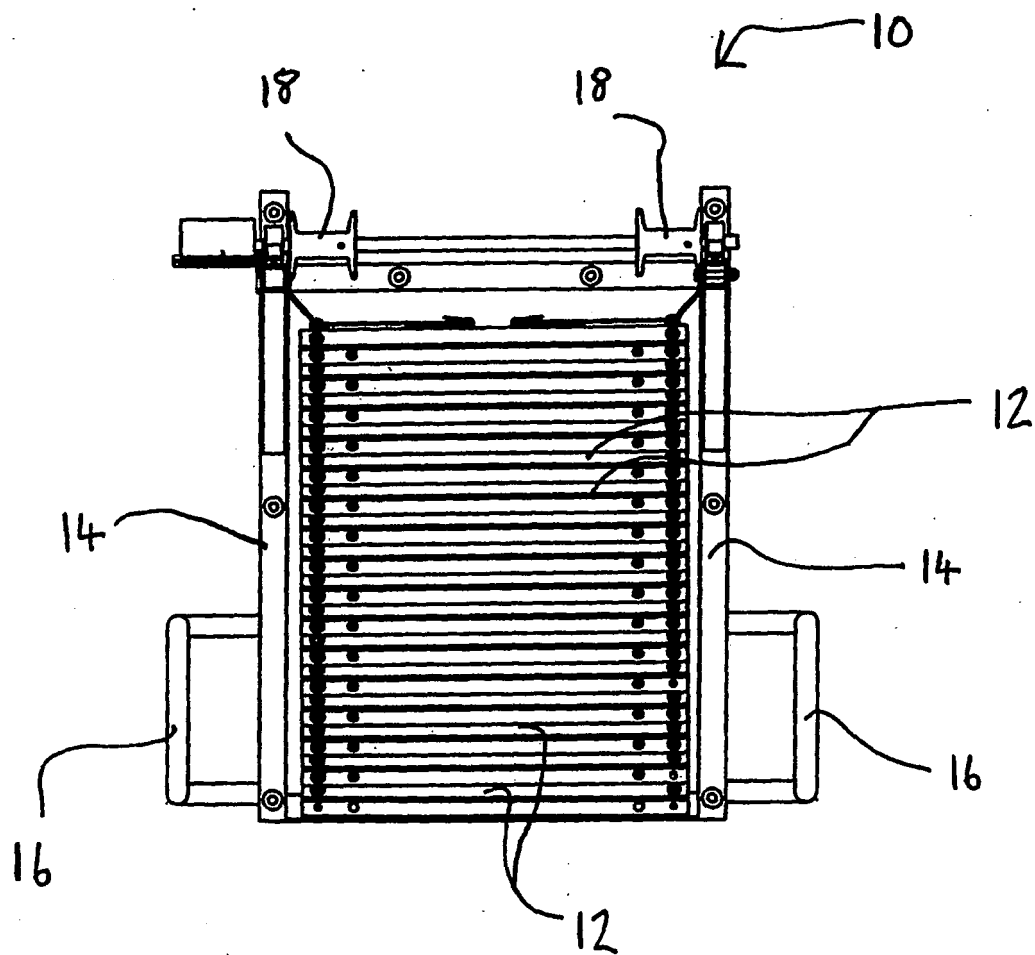


Figure 1

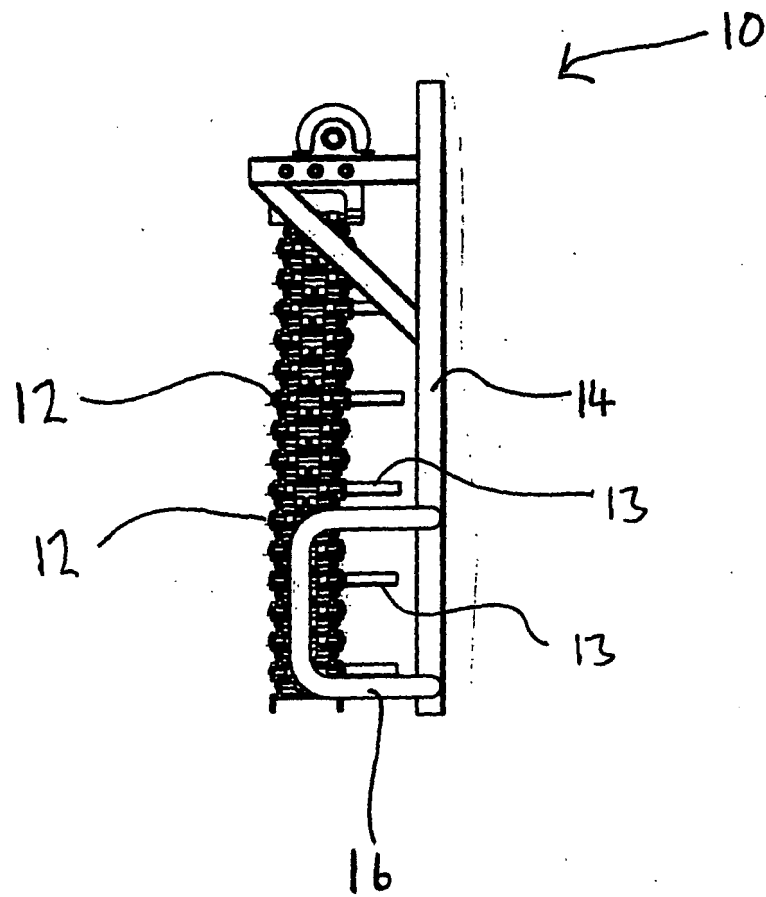
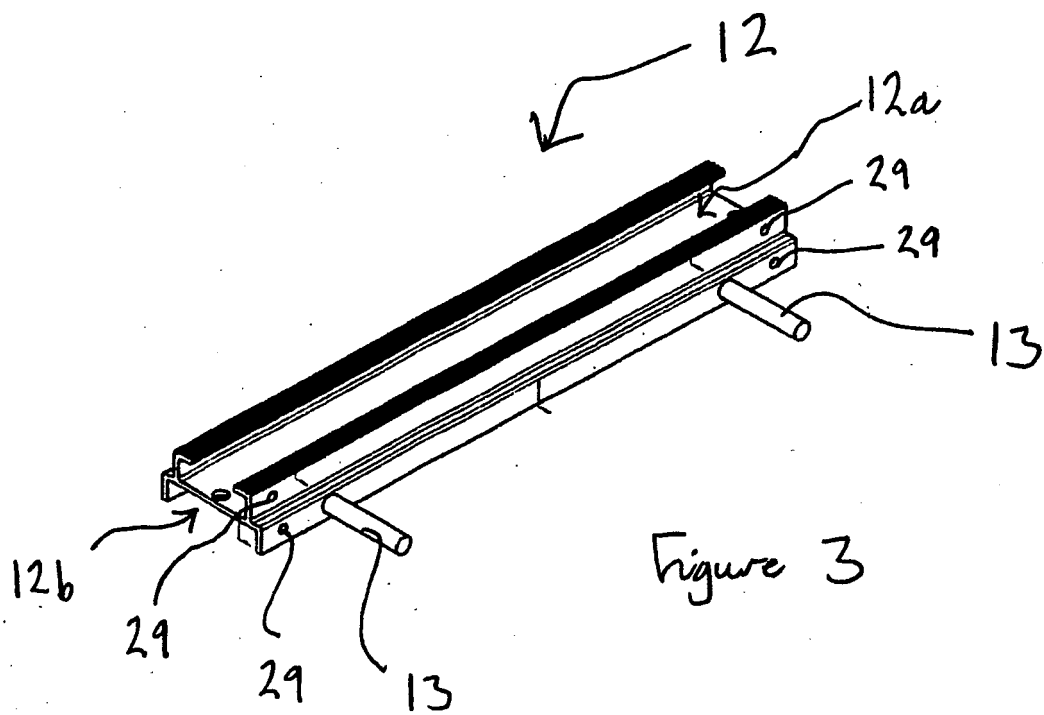
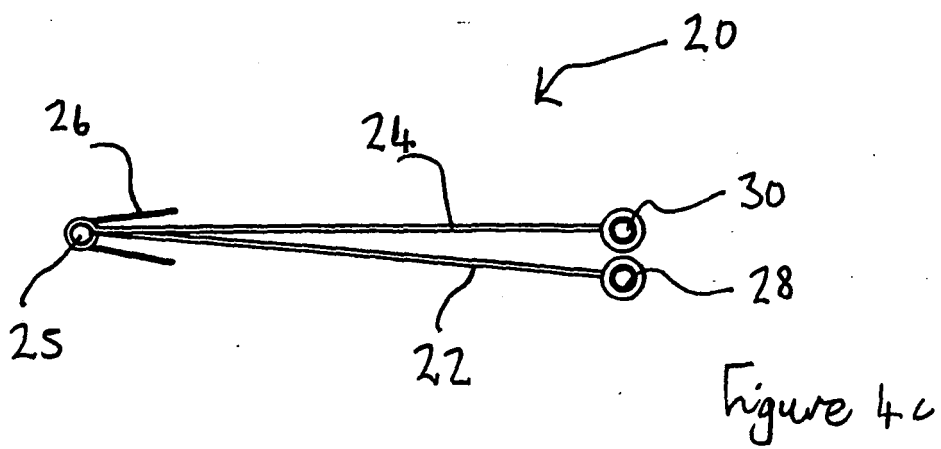
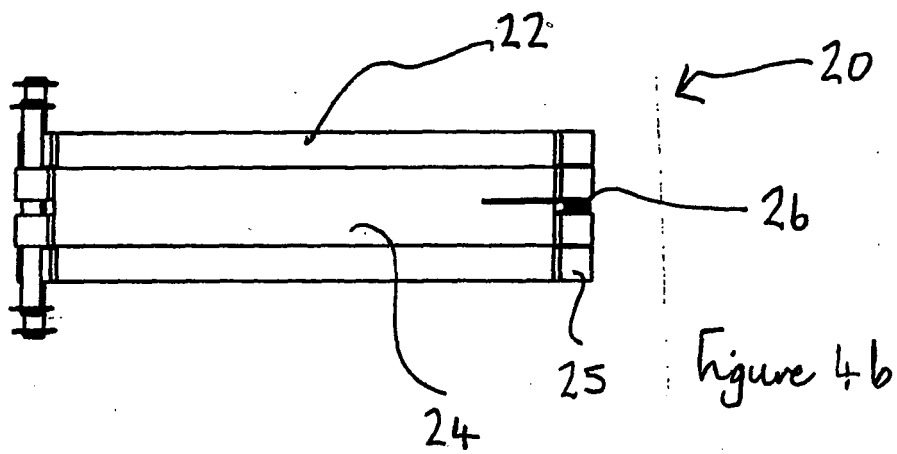
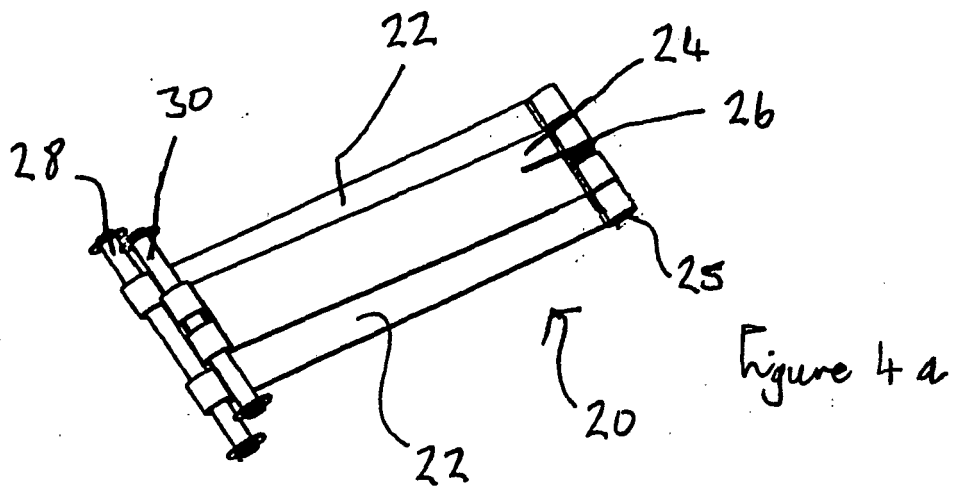


Figure 2





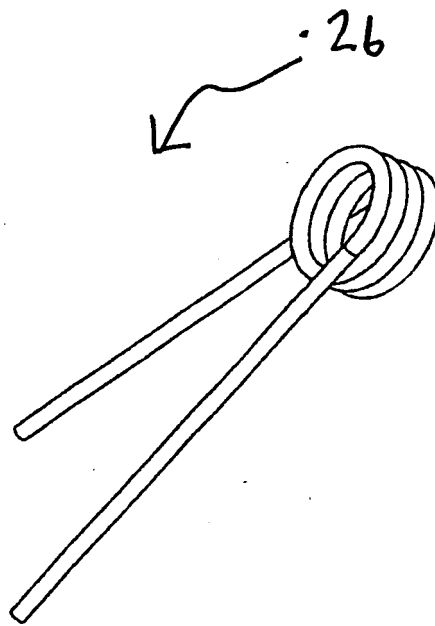


Figure 5

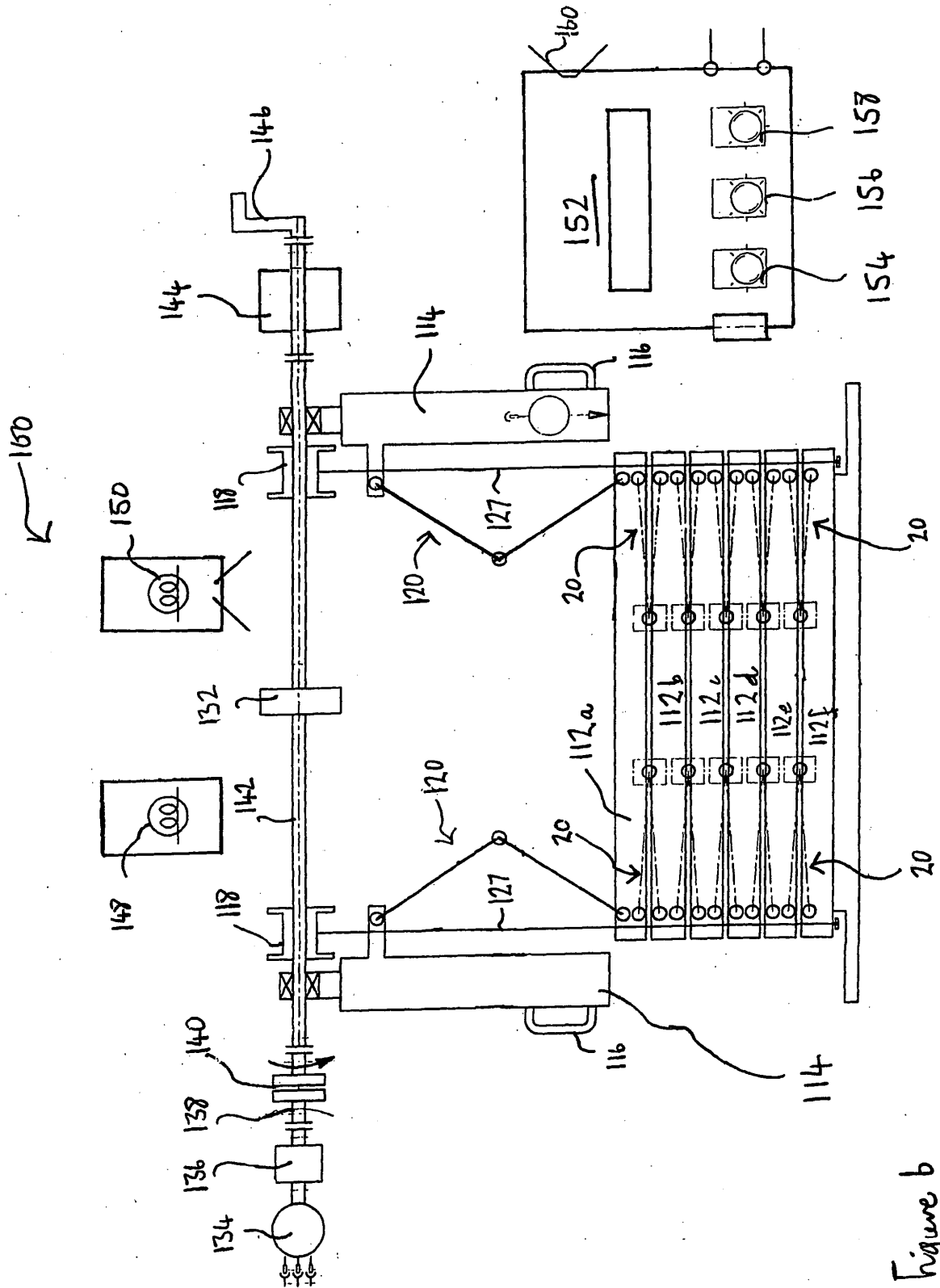
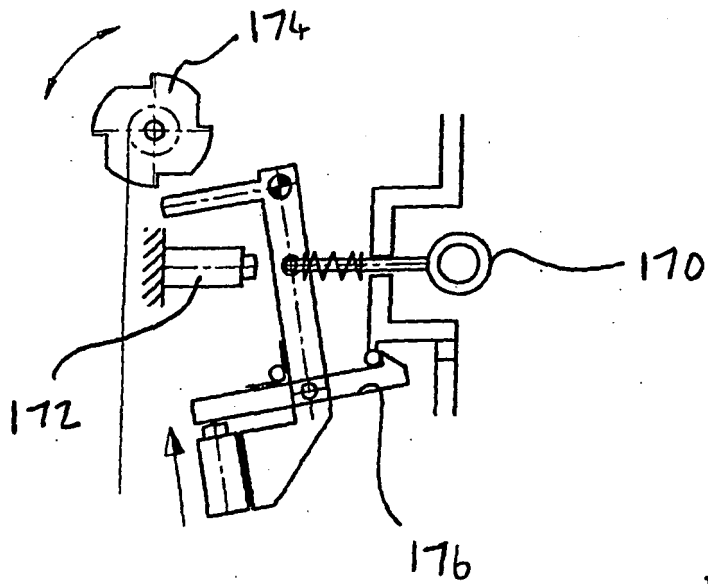
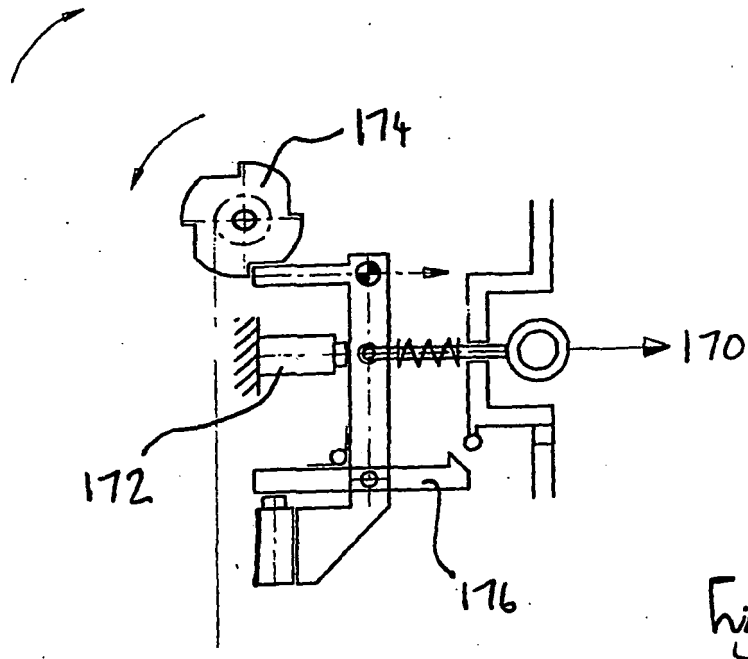


Figure b



REFERENCES CITED IN THE DESCRIPTION

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