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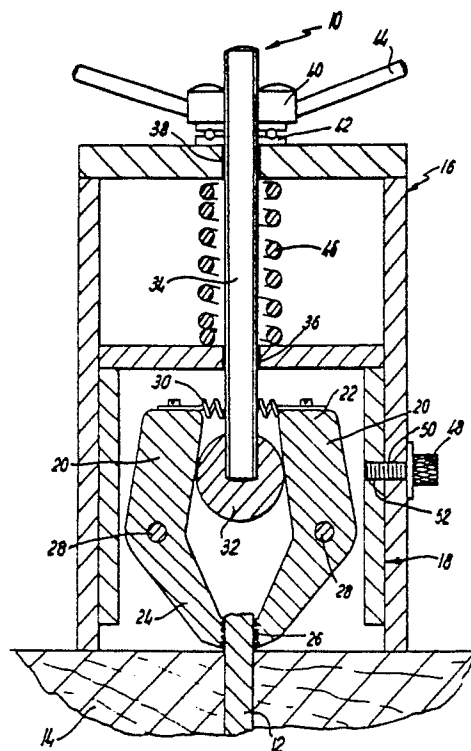

 Applicant: **Shinesharp Limited**  
**Oakwood Cheddleton Road**  
**Birchall Nr. Leek Staffordshire(GB)**


 Inventor: **Spooner, Robert Philip**  
**Moorside Bungalow Eaves Lane**  
**Bucknall Stoke-on-Trent, ST2 8LY(GB)**  
 Inventor: **Spalding, Maurice,**  
**Hollies, 3 Thistlebarrow Road,**  
**Salisbury, Wiltshire, SP1 3RT,(GB)**


 Representative: **Campbell, Iain Angus**  
**Swindell & Pearson 48 Friar Gate**  
**Derby DE1 1GY(GB)**


**Apparatus for extracting nails, bolts and the like.**


 Apparatus for extracting nails comprising an open-ended framework 19 movably mounted within an open-ended frame 16. A pair of jaw members 20 with jaw faces 26, pivotally mounted about a point between the ends thereof in the framework 18. A cylindrical contact member 32 located between and in contact with a part of the jaw members on the far side of the mounting point relative to the opening in the frame, the parts on each jaw member being inclined relative to each other. The contact member mounting a threaded link 34 which extends therefrom away from the opening in the frame to the exterior of the frame. Rotatably mounted on an exterior of the frame a threaded nut 40 through which the link engagingly passes, whereby rotation of the nut moves the link and thus the contact member relative to the frame, closing or opening the jaw faces or moving the framework relative to the frame.



**FIG. 1**

EP 0 276 553 A1

### Article Handling Apparatus

The present invention relates to apparatus for pulling an article away from a surface and particularly but not exclusively to apparatus for extracting nails.

From hereinafter the word nail is to be taken to include nails, pins, bolts, staples and other such fasteners.

Heretofore nails have been extracted from wood using a claw hammer, jemmy or other lever equivalent which engage beneath the head of the nail. These tools often damage the wood around the nail. Also it is often the case that the nail head breaks off so that the wood around the remaining nail shank has to be removed to permit extraction of the nail. This operation is time consuming and damages the wood.

According to the present invention there is provided apparatus for pulling an article away from a surface, the apparatus comprising a frame engageable with the surface, an assembly movably mounted within the frame and means for moving the assembly, the assembly including jaw means and means for operating the jaws means to grip an article, whereby the article has been gripped the assembly may be moved within the frame to pull the article away from the surface.

Preferably the means for operating the jaw means, and the means for moving the assembly within the frame, are operatively connectable to the same prime mover.

Preferably means are provided to prevent movement of the assembly relative to the frame, until in use, a predetermined reactionary force is experienced by the jaw means, whereupon the assembly moves within the frame rather than the jaw means operating further.

The frame may include a sprung abutment which prevents movement of the assembly until the reactionary force experienced by the jaw means is sufficient to overcome the spring loading of the abutment. The spring loading of the abutment is preferably adjustable, and the abutment may comprise a sprung ball bearing. Alternatively, means may be provided for selectively preventing movement of the assembly irrespective of the reactionary force experienced by the jaw.

Preferably the frame defines an opening which, in use, faces the surface from which the article is to be pulled. The assembly is preferably movable within the frame in a direction towards or away from the opening.

Preferably the assembly includes an open-ended framework slidable within the frame, the opening in the framework facing in the same direction as the opening in the frame with the jaw means

being mounted within the framework.

The jaw means preferably comprises a plurality of jaw members. Each jaw member is preferably pivotally mounted to the framework at a point on the jaw member between each of the ends thereof, about an axis oriented substantially parallel to the plane of the opening in the frame.

Preferably part of the section of the jaw members on the near side of the point of pivotal mounting relative to the opening in the frame, forms the jaw faces.

Preferably at least a part of the section of each of the jaw members on the far side of the point of pivotal mounting relative to the opening in the frame, presents a contact face facing substantially towards the other jaw member(s) and being inclined with respect to the other such contact faces on the other jaw members.

Preferably the contact surfaces are inclined towards each other in the direction away from the opening in the frame. Preferably the apparatus includes a contact member located between and engaging with the contact faces, and movable in a direction towards or away from the opening in the frame to respectively close and open the jaw faces.

Preferably a link is connected to the contact member, and said link may extend beyond the frame in a direction away from the opening therein.

The link may be threaded and may exchange in a threaded nut rotatably mounted on an external face of the frame, whereby rotation of the nut causes the link and thus the contact member to move relative to the frame.

Preferably the framework is spring biased towards the opening in the frame. Preferably also the jaw faces are spring biased apart.

Alternatively the line may engage with linear drive mean, and pneumatic or hydraulic drive means may be used to move the link, said drive means may be located within the frame.

In a further alternative no threaded nut is provided on the frame and the contact member is internally threaded whereby rotation of the link causes the contact member to move relative to the link. Means may be provided on the end of the link remote from the contact for connection thereon to a drill or similar piece of equipment.

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

Fig. 1 is a diagrammatic cross-sectional elevation of an extract or apparatus in use;

Fig. 2 is a diagrammatic cross-sectional elevation of part of a further embodiment of the apparatus; and

Fig. 3 is a view from below of the apparatus of Fig. 2.

Fig. 1 shows an apparatus 10 suitable for removing nails and the like from pieces of wood. This figure shows the apparatus removing a nail 12 from a piece of wood 14.

The apparatus 10 comprises an open-ended rectangular frame or case 16. Slidably mounted therein is an open-ended rectangular framework 18. The open ends of the case 16 and framework 18 both face in the same direction.

Pivotaly mounted to and substantially within, the framework 18 are a pair of jaw members 20. The members 20 comprise a first portion 22 of substantially rectangular cross-section and a second portion 24 extruding from one end thereof and inclined with respect thereto. The second portion 24 has a cross-section that tapers towards its free end. A serrated portion 26 is provided on an inside face of said free end and constitutes a jaw face. Each of the jaw members 20 is pivotally mounted in a symmetrical arrangement on pins 28 extending across the framework 18 substantially parallel to the opening therein. The members 20 are both so mounted that their second portions 24 are towards the open end of the framework 18, and the ends of each of the members 20 are inclined towards each other. A spring 30 is mounted between the free ends of the first portions 22 urging them towards each other.

A substantially cylindrical contact member 32 is located between and in contact with the first portions 22 of the members 20. A threaded rod 34 is mounted at one end thereof to the contact member 32 and extends away from the opening in the framework 18 and passes through holes 36, 38 respectively in the closed end walls of the framework 18 and the case 16. A nut 40 is rotatably mounted by a bearing 42 on the exterior of the case 16 and concentric with the hole 38, and threadingly engages the rod 34.

A pair of bars 44 are provided extending from opposite sides of the nut 40 to permit turning thereof by hand. A spring 46 extends between the case 16 and the framework 18 and surrounds the rod 34. The spring 46 urges the case 16 and framework 18 apart. A threaded pin 48 is provided which is engagable in threaded holes 50 and 52 provided in side walls of the case 16 and framework 18 respectively, to lock the framework 18 against the case 16.

In use, the case 16 is rested on the surface 14 from which the nail 12 is to be removed. The case 16 is positioned so that the jaw faces 26 lie either side of the nail 12. The nut 40 is then rotated using the bars 44 such that the rod 34 rises relative to the case 16 bringing the cylindrical member 32 causes the first portions 22 of the jaw members to

move apart and thus the second portions 24 to move together and the jaw faces 26 to grip the nail 12.

It is ensured that the threaded pin 48 is not engaging in the hole 52 in the framework 12. When the reactionary force exerting by the nail 12 on the jaw faces 26 reaches a particular value, further rotation of the nut 40 will overcome the frictional forces between the casing 16 and the framework 18 and the downward forces provided by the spring 46 and the framework 18 will thus move towards the nut 40. This movement extracting the nail 12 from the wood 14.

When the nail 12 has been extracted it can be removed from the apparatus by rotating the nut 40 in the opposite direction. Springs 30 and 46 respectively urge the jaw faces 26 apart, and the framework 18 into its original position relative to the casing 16. If the nail 12 is tightly embedded in the wood 14, the pin 48 can be initially threaded into the hole 52 thus permitting a tighter gripping force to be applied to the nail 12. When an effective grip on the nail has been achieved the pin 48 can then be removed from the hole 52 and the nail 12 removed as described in the above manner.

Figs. 2 and 3 show part of a preferred embodiment of the invention. This embodiment is a variation of that shown in Fig. 1 and exactly corresponding components have been given the same reference numerals and functional equivalents of the components of Fig. 1 have one hundred added to their reference numerals. In this embodiment the jaw members 120 are of a slightly different shape and are both pivotally mounted on a single central pin 128.

Mounted on the outside of one side of the case 116, aligned with an aperture therein is a threaded annular plate 160. A threaded bolt 162 engages in the plate 160. A spring biased ball bearing 164 is mounted so as to protrude from the free end of the bolt 162.

Upon commencement of extracting a nail using this apparatus, the ball bearing 164 engages with an edge of the upper surface of the framework 118 to provide a force in addition to the frictional force between the case 116 and framework 118 and the downwards force provided by the spring 46, these forces initially preventing the framework 118 from moving relative to the case 116. The framework 118 will not so move until the jaw faces experience a reactionary force greater than the sum of the above mentioned frictional force and the force required to push the ball bearing 164 into the bolt 162 and thus out of the path of the framework 118. It is to be realised that by moving the bolt 162 into or out of the case 116, the force required to move the ball bearing 164 from the path of the framework 118 will be varied.

The above example thus describes apparatus of relatively simple construction which thus can be relatively inexpensively manufactured. The relatively simple construction permits the apparatus to be made with robust components. This apparatus can be used for extracting nails whether or not a head is provided thereon. This apparatus permits a nail to be gripped and extracted in the one action.

Various modifications may be made without departing from the scope of the invention. For example the jaw faces may be formed into different shapes. Three or more jaw members could be provided. The contact member may be of a different shape. Different means can be provided for preventing relative movement of the case and framework prior to a pre-determined reactionary force being experienced by the jaw faces.

The contact member may be moved relative to the case by means other than those described above. For example hydraulic or pneumatic power means could be used to linearly move the rod, and such a power source may be located within the case. Alternatively the contact member could be threadably engaged on the rod and means could be provided for connecting the rod to a powered hand drill or other such device for rotation thereof. In this instance the contact member moves linearly relative to the rod.

## Claims

1. Apparatus for pulling an article away from a surface, characterised in that the apparatus comprises a frame engageable with the surface, an assembly movable mounted within the frame and means for moving the assembly, the assembly including jaw means and means for operating the jaws means to grip an article, whereby after the article has been gripped the assembly may be moved within the frame to pull the article away from the surface.

2. Apparatus according to claim 1, characterised in that the means for operating the jaw means, and the means for moving the assembly within the frame, are operatively connectable to the same prime mover.

3. Apparatus according to claims 1 or 2, characterised in that means are provided to prevent movement of the assembly relative to the frame, until in use, a predetermined reactionary force is experienced by the jaw means, whereupon the assembly moves within the frame rather than the jaw means operating further.

4. Apparatus according to claim 3, characterised in that the frame includes a sprung abutment which prevents movement of the assembly until the

reactionary force experience by the jaw means is sufficient to overcome the spring loading of the abutment.

5. Apparatus according to claim 4, characterised in that the spring loading of the abutment is adjustable.

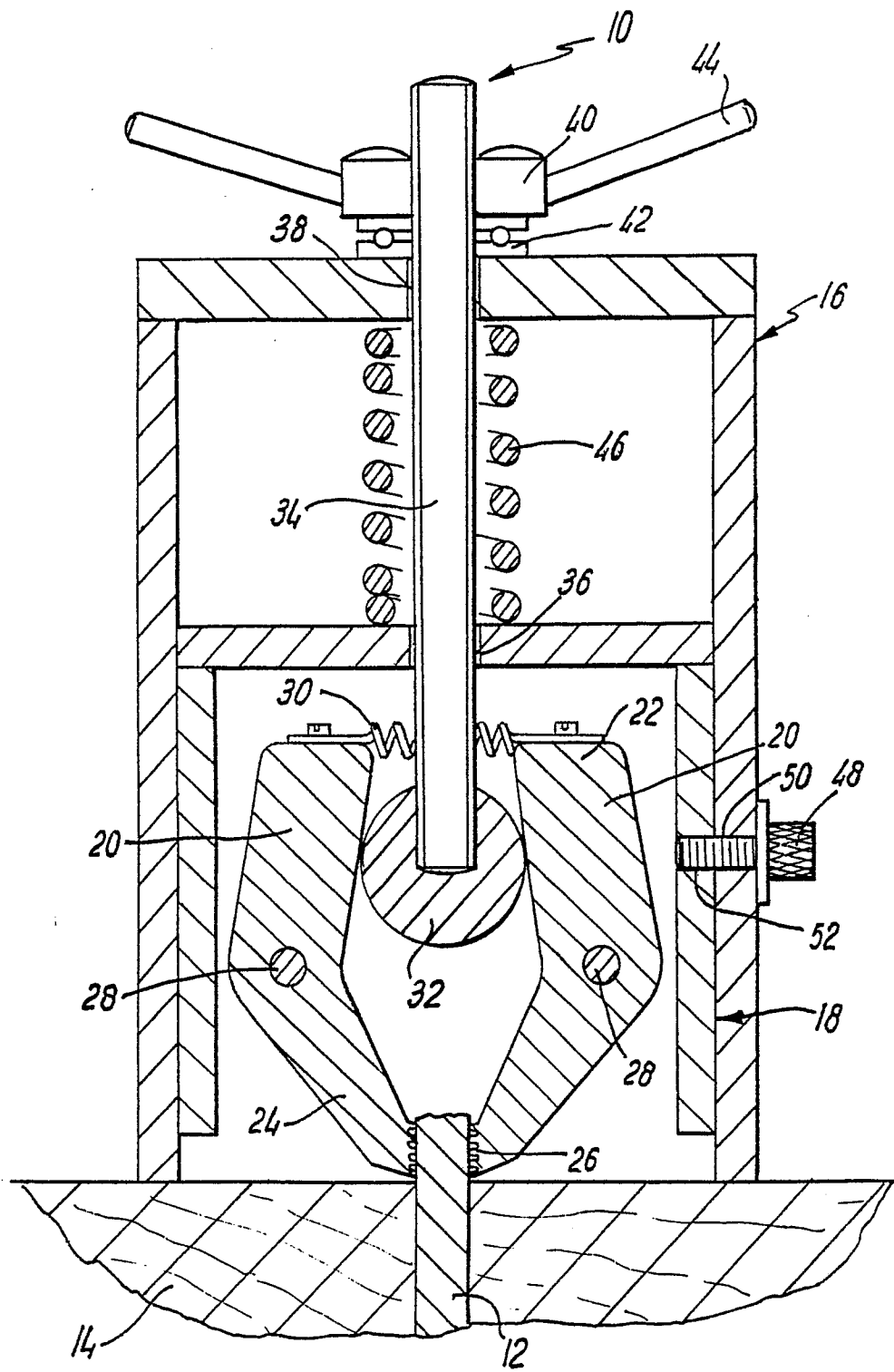
6. Apparatus according to any of the preceding claims, characterised in that the frame defines an opening which, in use, faces the surface from which the article is to be pulled and the assembly includes an open-ended framework, the opening in the framework facing in the same direction as the opening in the frame with the jaw means being mounted within the framework, the assembly being movable within the frame in a direction towards or away from the opening in the frame.

7. Apparatus according to claim 6, characterised in that the jaw means comprises a plurality of jaw members, which are pivotally mounted to the framework at a point on the jaw member between each of the ends thereof, about an axis orientated substantially parallel to the plane of the opening in the frame.

8. Apparatus according to claim 7, characterised in that part of the section of the jaw members on the near side of the point of pivotal mounting relative to the opening in the frame, forms the jaw faces and at least a part of the section of each of the jaw members on the far side of the point of pivotal mounting relative to the opening in the frame, presents a contact face facing substantially towards the other jaw member(s), the contact faces being inclined towards each other in the direction away from the opening in the frame; the apparatus also including a contact member located between and engaging with the contact faces, and movable in a direction towards or away from the opening in the frame to respectively close and open the jaw faces.

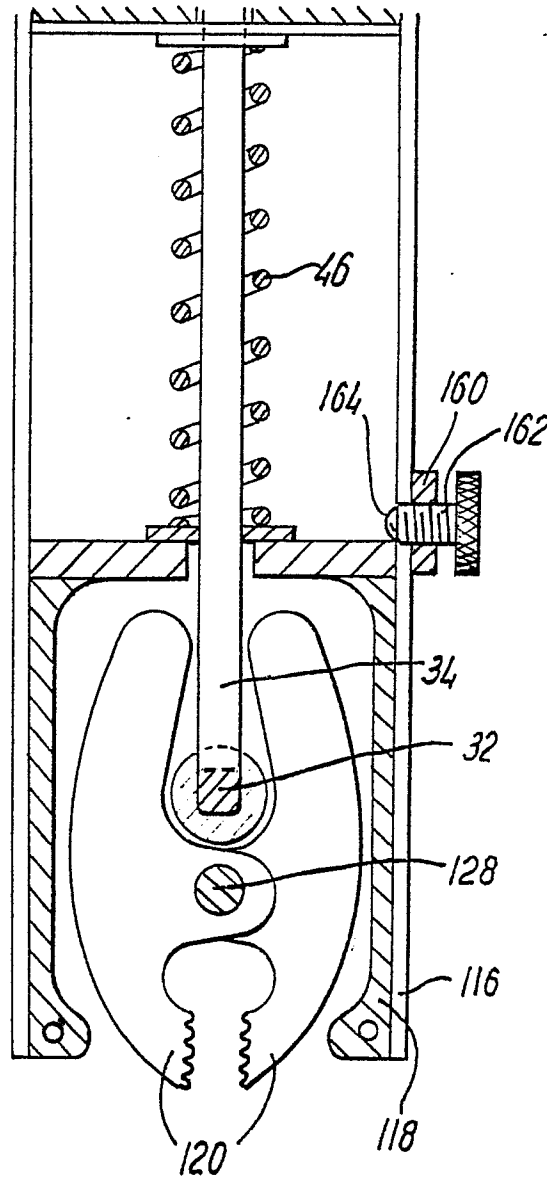
9. Apparatus according to claim 8, characterised in that a link is connected to the contact member, and said link extends beyond the frame in a direction away from the opening therein, and the link is threaded and engages in a threaded nut rotatably mounted on an external face of the frame, whereby rotation of the nut causes the link and thus the contact member to move relative to the frame.

10. Apparatus according to any of claims 6 to 9, characterised in that the framework is spring biased towards the opening in the frame, and the jaw faces are spring biased apart.

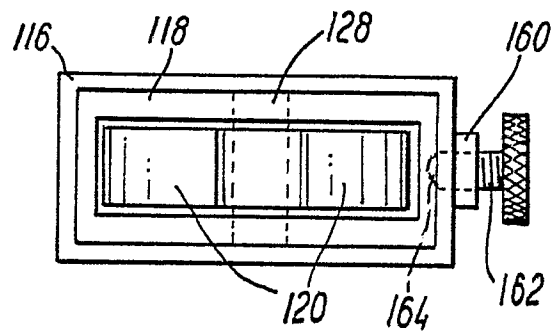


**FIG. 1**

**FIG. 2**



**FIG. 3**





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application number

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                               |                                                | EP 87310799.9                                 |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------------------|------------------------------------|--|------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------|---------------------------------------|----------------------------|--------------------------------------|---------------------------|--------------------------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim                              | CLASSIFICATION OF THE APPLICATION (Int. Cl.4) |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | GB - A - 282 234 (BATTEN)                                                     | 1,2                                            | B 25 C 11/02                                  |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | * Totality *                                                                  | 7,9,10                                         | B 25 C 11/00                                  |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
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| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | GB - A - 168 101 (TAGG)                                                       | 1,2,9                                          |                                               |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | * Totality *                                                                  |                                                |                                               |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
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| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                               |                                                |                                               |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
| Place of search<br>VIENNA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                               | Date of completion of the search<br>09-05-1988 | Examiner<br>KNAUER                            |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
| <table border="0"><tr><td><b>CATEGORY OF CITED DOCUMENTS</b></td><td></td></tr><tr><td>X : particularly relevant if taken alone</td><td>T : theory or principle underlying the invention</td></tr><tr><td>Y : particularly relevant if combined with another document of the same category</td><td>E : earlier patent document, but published on, or after the filing date</td></tr><tr><td>A : technological background</td><td>D : document cited in the application</td></tr><tr><td>O : non-written disclosure</td><td>L : document cited for other reasons</td></tr><tr><td>P : intermediate document</td><td>&amp; : member of the same patent family, corresponding document</td></tr></table> |                                                                               |                                                |                                               | <b>CATEGORY OF CITED DOCUMENTS</b> |  | X : particularly relevant if taken alone | T : theory or principle underlying the invention | Y : particularly relevant if combined with another document of the same category | E : earlier patent document, but published on, or after the filing date | A : technological background | D : document cited in the application | O : non-written disclosure | L : document cited for other reasons | P : intermediate document | & : member of the same patent family, corresponding document |
| <b>CATEGORY OF CITED DOCUMENTS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                               |                                                |                                               |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
| X : particularly relevant if taken alone                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | T : theory or principle underlying the invention                              |                                                |                                               |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
| Y : particularly relevant if combined with another document of the same category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | E : earlier patent document, but published on, or after the filing date       |                                                |                                               |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
| A : technological background                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | D : document cited in the application                                         |                                                |                                               |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
| O : non-written disclosure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | L : document cited for other reasons                                          |                                                |                                               |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |
| P : intermediate document                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | & : member of the same patent family, corresponding document                  |                                                |                                               |                                    |  |                                          |                                                  |                                                                                  |                                                                         |                              |                                       |                            |                                      |                           |                                                              |

TECHNICAL FIELDS  
SEARCHED (Int. Cl.4)

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