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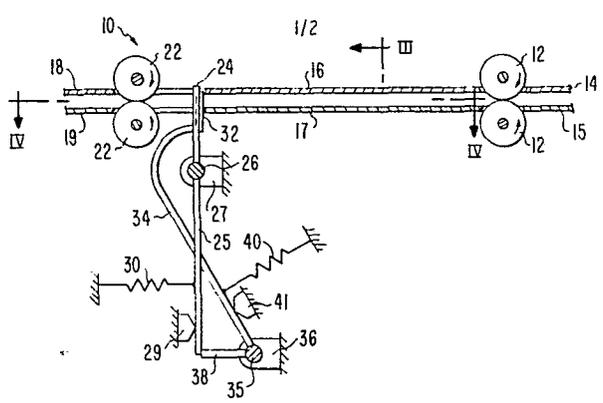
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(54) **Apparatus for aligning pliable sheet material.**

(57) In an apparatus for aligning pliable sheet material, such as paper, feed rollers (12) feed the material between guide members (16, 17) so that its leading edge is forced against at least a portion of a stop surface (24) and then, if necessary, the material buckles to allow its leading edge to align with the stop surface (24). The stop surface (24) is formed on an alignment lever (25) which is held fast on a shaft (26) which can pivot in bearings (27). However, the alignment lever (25) is latched by a latch bar (38) so that the stop surface (24) lies in the path of the sheet material. A sensing member (32) senses when the leading edge of the material is aligned with the stop surface (24) and releases the latch bar allowing the lever (25) to pivot, due to sheet material being forced against the stop surface (24) by the feed rollers (12), so that the material enters the nip between transport rollers (22). The sensing member (32) is disposed at one end of a lever (34) which is held fast on a shaft (35) pivotally mounted in bearings (36), the latch bar (38) being also held fast on shaft (35). Alternatively, the latch bar (38) may be released from the lever (25) in response to photoelectric sensing of the fact that the leading edge of the material is aligned with the stop surface (24).



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APPARATUS FOR ALIGNING PLIABLE SHEET MATERIAL

This invention relates to apparatus for aligning pliable sheet material, such as paper.

The need for properly aligning pliable sheet material such as paper being conveyed by rollers or other transport means for such purposes as copying, printing and reading has long been recognized. Quite commonly it is desirable to position the leading edge of the sheet material perpendicular to the direction of travel, but uneven feed or biased conveying members often cause the sheet material to take a skewed position. Numerous suggestions have been made as to means and methods to properly orient such pliable sheet material.

Apparatus for aligning pliable sheet material can comprise guide means defining a predetermined path for the sheet material, stop means movable into and out of said predetermined path, feed means to feed a sheet so that its leading edge is forced against the stop means when it is in said predetermined path and transport means arranged to receive and positively engage the sheet when the stop means is subsequently moved out of said predetermined path. One example of an apparatus of that type is the mechanism described in U.S. Patent Specification 3,667,752, in which a plurality of pivotally mounted fingers intercept the leading edge of a travelling document thereby causing the document to be urged into compliance with the desired orientation as defined by the fingers. The fingers are pivotally mounted such that the force of the conveyed document displaces the fingers thus permitting the documents to be engaged by the entrance nip of the transport system adjacent the

pivotally mounted fingers. While this arrangement is a worthwhile and workable mechanism, it will be readily apparent that documents of different weight and thickness would of course require adjustment of the resisting force of the fingers. Particularly stiff documents would, for instance, tend to move the fingers and release the document for the transport system before alignment is accomplished. On the other hand, lightweight documents could well jam the mechanism since insufficient force could be transmitted through the buckling document to move the fingers.

The invention seeks to overcome the problem of providing a simple mechanism for accomplishing alignment of pliable sheet material of varying stiffness, and is characterised by stop means comprising a pivotally mounted lever having a flat stop surface, latch means to releasably hold the pivotally mounted lever so that said flat stop surface lies in said predetermined path, latch releasing means operable to sense when the leading edge of the sheet lies substantially in the plane containing said stop surface and, upon such sensing, to release the latch whereby a sheet fed by the feed means will first engage at least a portion of the stop surface and then, if necessary, buckle to allow its leading edge to align with the stop surface whereupon the latch releasing means releases the latch enabling the leading edge of the sheet to be engaged by the transport means with the sheet in correct alignment.

The claimed invention may be carried out in the ways described in detail below with reference to the accompanying drawings, in which :-

FIGURE 1 is a simplified, partially sectioned view of an apparatus, according to the invention, for aligning pliable sheet material in a position to receive the sheet material;

FIGURE 2 is a view similar to that of FIGURE 1 illustrating the apparatus with the alignment member released allowing the pliable sheet material to pass to the transport rollers;

FIGURE 3 is a section on line III-III of FIGURE 1;

FIGURE 4 is a section on line IV-IV of FIGURE 1 and illustrates a typical reorientation of a pliable sheet; and

FIGURE 5 is a block diagram of a position sensing arrangement which can be used in the apparatus of FIGURE 1.

An apparatus 10 (FIGURE 1) for aligning pliable sheet material, such as paper, includes driven feed rollers 12, positioned to engage and urge forward pliable sheet material conducted between inlet upper guide member 14 and inlet lower guide member 15. Intermediate upper guide member 16 and intermediate lower guide member 17 loosely confine the sheet material fed between feed rollers 12, and are, as illustrated, aligned with inlet guide members 14 and 15, and exit upper guide member 18 and exit lower guide member 19. Transport rollers 22, similar to feed rollers 12, are interposed between intermediate guide members 16 and 17, and exit guide members 18 and 19. Immediately adjacent transport rollers 22 and extending between guide members 16 and 17 is one end of a lever member 25 having a flat stop surface 24 which is disposed perpendicular to the path of travel, and thus defines the

desired orientation of the leading edge of pliable sheet material urged forward by feed rollers 12. Lever member 25 is held fast on pivot shaft 26 which is journalled in bearings 27. Stop 29 engages lever member 25 and spring 30 urges lever member 25 against stop 29.

As shown particularly well in FIGURES 1 and 3, position sensing member 32 is disposed adjacent to and somewhat forward of flat stop surface 24. For purposes of discussion, position sensing member 32 will be referred to as aligned with stop surface 24, but it is to be understood that position sensing member 32 will actually be forward of stop surface 24 to a greater or lesser extent to indicate incipient contact of conveyed pliable sheet material with stop surface 24. Support shaft 34 carries position sensing member 32 and in turn is held fast on pivot shaft 35 mounted in bearings 36. Latch bar 38 is held fast on pivot shaft 35 and, as shown in FIGURE 1, engages the end of lever member 25 to latch it and secure stop surface 24 in the position to which the leading edge of the pliable sheet member is made to conform. Spring 40 urges support shaft 34 against stop 41 as illustrated.

As shown in FIGURE 4, an article of pliable sheet material such as paper sheet in a skewed orientation 45' is urged forward by, as is apparent from FIGURE 1, feed rollers 12. The initially skewed paper engages only one portion of stop surface 24, but upon continued feed of the paper, buckles to bring its leading edge into engagement with both portions of stop surface 24 and so the paper is reoriented into position 45. When the leading edge of the paper is substantially in full contact with stop surface 24 centrally located position sensing member 32 is contacted and, as shown in FIGURE 2, latch bar 38 pivots to release lever member 25 and permits stop surface 24 to conduct the leading edge of the paper into the nip of transport rollers 22 which thus engage the paper in the desired alignment for continued, aligned transport.

From the illustrations of FIGURES 1 through 4, and the above discussion, it will be apparent that pliable materials of many weights and rigidity can be equally well aligned by aligning apparatus 10 in that feed rollers 12 will provide sufficient force to buckle and align the leading edge of the paper against stop surface 24. Only upon such a proper alignment does position sensing member 32 unlatch lever member 25 for engagement by transport rollers 22. Preferably, the resistance to forward movement of paper 45 by sensing member 32 is quite minimal to accomodate both lightweight and heavier pliable materials.

An alternative to the preferred mechanical arrangement illustrated in FIGURES 1 through 4 is shown in the block diagram of FIGURE 5. As illustrated, a light source 50 and photodetector 52 are arranged at a position equivalent to that occupied by position sensing member 32 of the embodiment of FIGURE 1. Light source 50 and photodetector 52 are both supplied with preferrably low voltage power from power supply 53 through lines 55 and 56, respectively. Thus, again with reference to the embodiment of FIGURES 1 through 4, upon alignment of the leading edge of the paper, light source 50 would be shielded from photodetector 52 thereby causing an output through line 58 to relay 60. Relay 60 in turn would through line 62 activate switch 64 which is connected to power supply 65, a higher voltage power supply in the preferred arrangement, through line 66. Thus switch 64 would connect line 68, and accordingly latch motor 69 with power supply 65 to activate latch motor 69 which in turn would release lever member 25 of FIGURES 1 through 4 in a manner entirely analagous to the mechanical latch disclosed in FIGURES 1 through 4. While the mechanical position sensing means and latch arrangement of FIGURES 1 through

4 is preferred for simplicity, reliability and cost effectiveness, the electrophoto arrangement of FIGURE 5 could also be used.

From the above illustrations and discussions, it will be apparent that the apparatus according to the invention provides for a very simple but yet versatile alignment of pliable sheet material being transported. Since the lever having the stop surface is latched and released only upon proper alignment, the device is not sensitive to substantial changes in the nature of the pliable sheet material. Though discussed in terms of aligning sheet material with the original nominal direction of travel, apparatus according to the invention could be employed to align sheet material along a different path of travel.

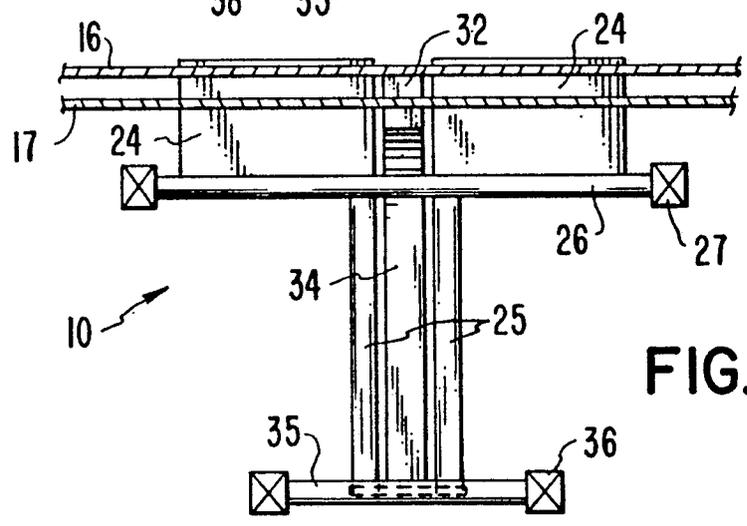
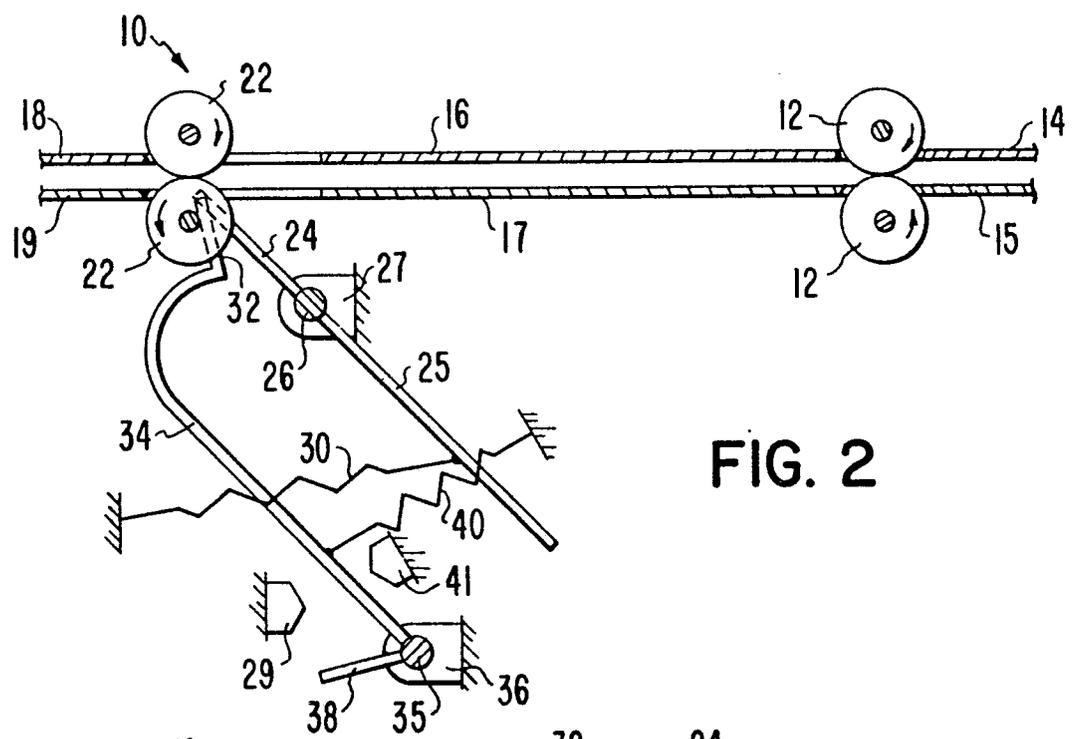
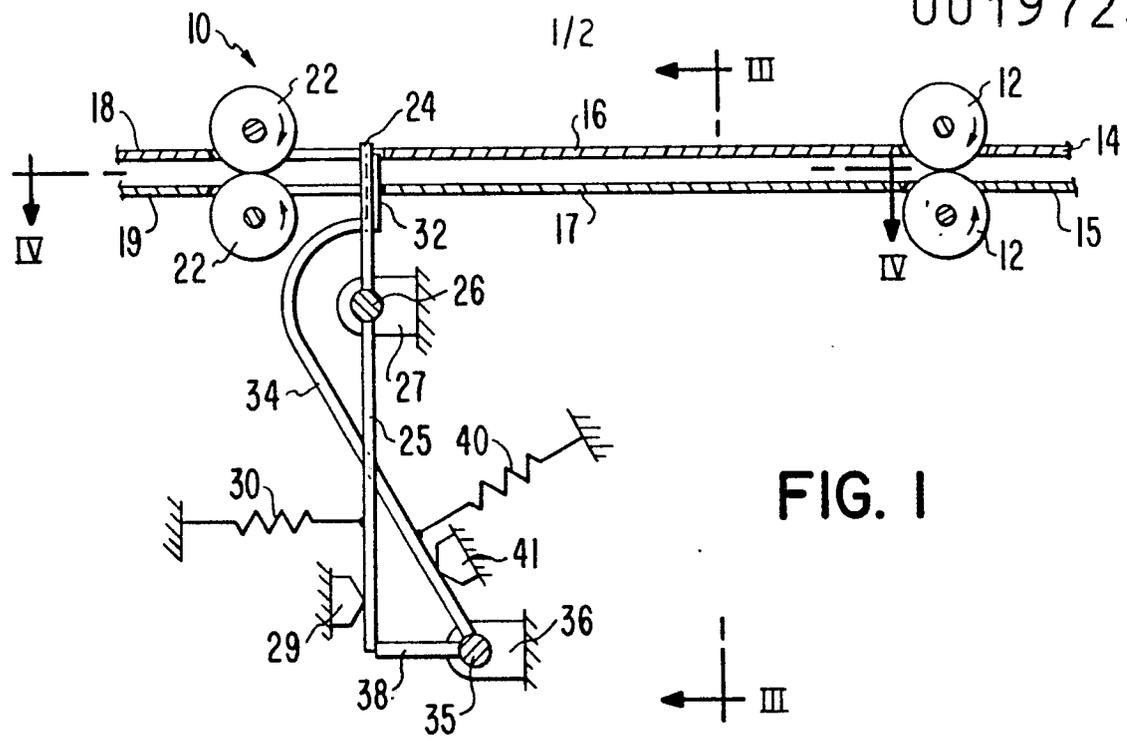
CLAIMS

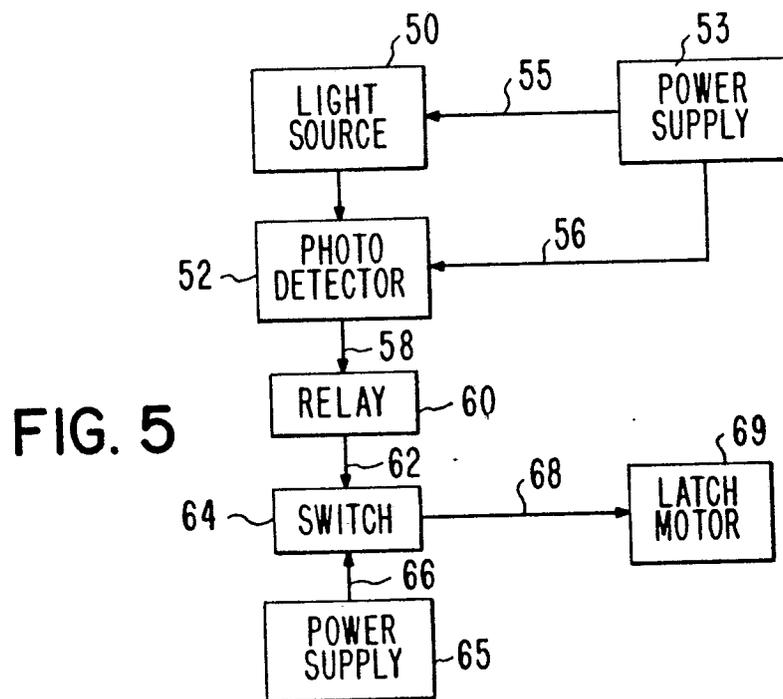
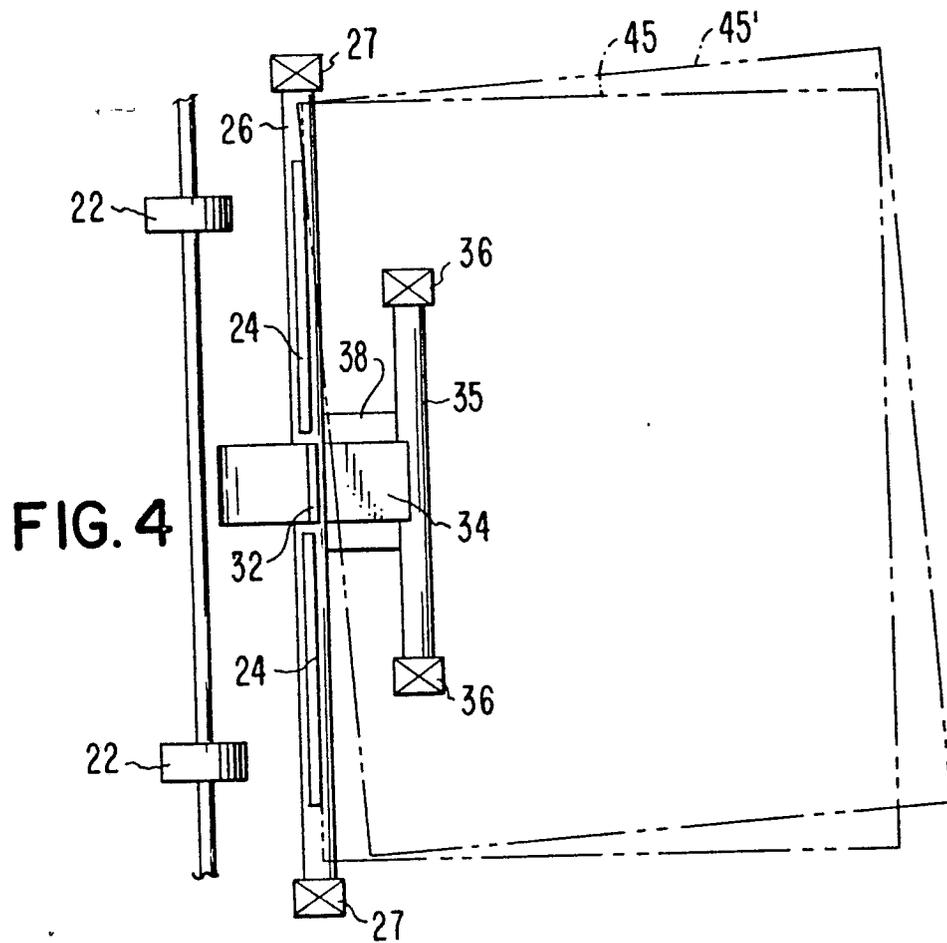
1. Apparatus for aligning pliable sheet material comprising guide means defining a predetermined path for the sheet material, stop means movable into and out of said predetermined path, feed means to feed a sheet so that its leading edge is forced against the stop means when it is in said predetermined path and transport means arranged to receive and positively engage the sheet when the stop means is subsequently moved out of said predetermined path, the apparatus being characterised by the stop means comprising a pivotally mounted lever 25 having a flat stop surface 24, latch means 38 to releasably hold the pivotally mounted lever so that said flat stop surface lies in said predetermined path, latch releasing means 32, 34 operable to sense when the leading edge of the sheet lies substantially in the plane containing said stop surface and, upon such sensing, to release the latch whereby a sheet fed by the feed means 12 will first engage at least a portion of the stop surface 24 and then, if necessary, buckle to allow its leading edge to align with the stop surface whereupon the latch releasing means 32, 34 releases the latch 38 enabling the leading edge of the sheet to be engaged by the transport means 22 with the sheet in correct alignment.
2. Apparatus as claimed in Claim 1, further comprising biasing means to resiliently urge the pivotally mounted lever to adopt a position in which the stop surface is in said predetermined path.
3. Apparatus as claimed in Claim 2, in which the latch releasing means comprises a pivotally mounted member biased into a position in which one of its ends is disposed in said predetermined path

within an opening in said stop surface, the pivotally mounted member being displaced when a sheet is fed against said one of its ends, and in which the latch means comprises a latch member connected to said pivotally mounted member.

4. Apparatus as claimed in Claim 2, in which the latch releasing means includes sensing means comprising a light source and a photosensor mounted in spaced relationship adjacent the stop surface and adapted to output a signal to release the latch means upon movement of the sheet between the light source and the photosensor.

5. Apparatus as claimed in any preceding Claim, in which the feed means and transport means each comprise a pair of driven rollers defining a nip therebetween to engage and convey the pliable sheet material.







DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. CL ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<p><u>US - A - 3 356 364</u> (H. GRIGEREIT) * column 3, lines 37 to 59 *</p> <p>--</p> <p><u>CH - A - 267 703</u> (HEADLEY TOWNSEND BACKHOUSE) * claims *</p> <p>--</p> <p><u>US - A - 1 591 126</u> (C.W. HARROLD) * page 2, lines 72 to 115 *</p> <p>--</p> <p><u>US - A - 2 433 120</u> (C.W. HARROLD) * column 3, lines 36 to 45 *</p> <p>--</p> <p><u>DE - C - 1 142 880</u> (ROLAND OFFSET- MASCHINENFABRIK, FABER & SCHLEICHER) * column 2, lines 42 to 52 *</p> <p>--</p> <p><u>DE - A1 - 2 816 074</u> (XEROX CORP.) * claims 1 to 16 *</p> <p>--</p> <p>D <u>US - A - 3 667 752</u> (C.S. SAMCZYK) * column 5, lines 1 to 15 *</p> <p>--</p> <p>A <u>US - A - 3 240 487</u> (W.B. TEMPLETON) * column 2, lines 30 to 62 *</p> <p>--</p> <p>A <u>DE - A1 - 2 820 037</u> (XEROX CORP.) * fig. 2 *</p> <p>--</p> <p style="text-align: center;">./..</p>	<p>1-3</p> <p>1-3</p> <p>1-3</p> <p>1-3</p> <p>1-3</p> <p>4</p> <p>1</p> <p>4,5</p>	<p>B 65 H 9/06 B 65 H 7/02</p> <p>TECHNICAL FIELDS SEARCHED (Int. CL³)</p> <p>B 41 F 21/00 B 65 H 7/00 B 65 H 9/00 G 03 B 27/00 G 03 G 15/00 G 03 G 21/00 G 06 K 13/00</p> <p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons</p> <p>&: member of the same patent family, corresponding document</p>
<input checked="" type="checkbox"/>	The present search report has been drawn up for all claims		
Place of search	Date of completion of the search	Examiner	
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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<p><u>US - A - 4 019 733</u> (M.S. MONTALTO) * claim 1 *</p> <p style="text-align: center;">--</p>		
A	<p><u>DE - A - 2 047 824</u> (ING. C. OLIVETTI & C., S.P.A.) * page 12, lines 15 to 30 *</p> <p style="text-align: center;">--</p>		
A	<p><u>US - A - 3 902 715</u> (L.C. HUBLER et al.) * fig. 7 to 9 *</p> <p style="text-align: center;">----</p>		<p>TECHNICAL FIELDS SEARCHED (Int. Cl.)</p>