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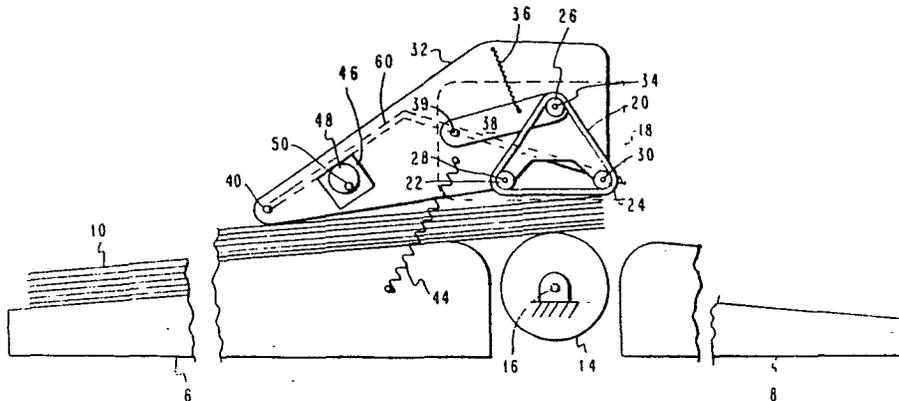
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54 **Apparatus for shingling sheets in a stack.**

57 The stack (10) to be shingled is positioned and held conforming about a high friction roller (14) by an endless pressure belt (20) mounted on two spaced idle pulleys (22, 24) and a

tensioning pulley (34). Rotation of roller (14) while stack (10) is so held drives stack (10) from support (6) to support (8) and produces equal edge separation of the sheets in stack (10).



APPARATUS FOR SHINGLING SHEETS
IN A STACKDescription

Technical Field

5 This invention relates to sheet separation. More particularly, it relates to providing uniform edge separation of all sheets in a stack.

Shingling as a method of sheet separation is known. For instance in U.S. Patent 3,008,709 to Buslik, assigned to the same assignee as the present invention, there is disclosed a shingler wheel the action of which causes a plurality of the uppermost sheets in a stack to be simultaneously fanned out in varying degrees around the axis of wheel rotation. Shingler wheels the action of which results in the uppermost sheets in stack being displaced in a direction perpendicular to the axis of wheel rotation are also known in the art. Shingling with wheels of either of the two above referenced types affects only those sheets closest to the shingling wheel, and then only to varying amounts. The indentation in the stack resulting from shingler wheel contact decays as the distance from the wheel increases. Shingling with these kinds of wheels requires repeated applications of the shingler wheel to the stack. Using these kinds of shigler wheels often times requires various other means for restraining subsequent sheets and for realigning the stack prior to the next shingler wheel contact.

It is an object of this invention to simplify sheet separation.

It is an object of the present invention to uniformly separate all sheets in a stack in one cycle of operation.

In accordance with the present invention, apparatus is provided for uniformly separating sheets in a stack in one cycle of operation. Sheets so separated may subsequently be picked and fed in any direction to any operation requiring cut sheets seriatim.

In an exemplary embodiment of the invention, a stack of cut sheets is held in partial conformity about the periphery of a high friction shingler roller by at least a pair of pulleys about which an endless feed belt travels. The invention proceeds from the fact that rotating the high friction shingler roller while the stack of sheets is so held causes the stack to pass between the roller and feed belt with the result that at the completion of its passage over the shingler roller the entire stack is uniformly separated. The amount of uniform separation between sheets is believed to be a function of the diameter of the high friction shingler roller. The larger the diameter of the roller, the smaller is the amount of separation so long as the feed belt and high friction shingler roller travel at the same velocity in the same direction.

The foregoing and other objects, features and advantages will become apparent from the following more particular description of a preferred embodiment of the invention as illustrated in the accompanying drawing.

Brief Description of the Drawings

Figure 1 shows a side view of apparatus for uniformly separating a stack of sheets.

Figure 2 shows the apparatus of figure 1 in its operative position.

Figure 3 shows the apparatus of figure 1 at completion of one cycle of operation.

Figure 4 is a top view of the apparatus of figure 3.

Description of a Preferred Embodiment

Referring now to figure 1, there is shown a side view of illustrative apparatus for uniformly separating a stack of sheets. Beds 6 and 8 are provided to support the stack 10 before, during and after separation. High friction shingler roller 14 is mounted for rotation about shaft 16. Clamp assembly, generally designated by reference numeral 18, includes endless feed belt 20 mounted about fixed pulleys 22 and 24 and floating pulley 26. Pulleys 22 and 24 are rotatably mounted on shafts 28 and 30, respectively, which shafts are attached to link member 32. Pulley 26 is mounted on stud 34 which is floatingly mounted via spring 36 loaded arm 38 on link member 32. Arm 38 is pivotally attached to link 32 at stud 39. Link member 32 is pivotable about shaft 40 attached to frame 42 (shown in figure 4).

Spring 44 is provided to bias link 32 and thus clamp assembly 18 in its downward, operative position. Generally square aperture 46 is also provided in link 32 to be the camming surface for eccentric cam 48 on cam shaft 50 which is also mounted on the frame. Cam 48 is used to raise and lower link 32 about pivot shaft 40. It is to be understood that this particular means for raising and lowering clamp assembly 18 is shown for illustrative purposes only and other means may be used without departing from the scope of the invention. As is also to be understood, shaft 50 which terminates in knob 52 (figure 4) may be rotated manually or mechanically.

Link 32 is indented in the area between pulleys 22 and 24 so that when clamp assembly 18 is lowered, belt 20 is able to conform itself and stack 10 about the periphery of shingler roller 14. This indented area and floating pulley 26 cooperate to provide contact between belt 20 and stacks of various thicknesses. Knife edge 60 shown in phantom, is provided for facilitating picking separated sheets. Knife edge 60 may be

seen more clearly in figure 4 and will be described having reference thereto.

Figures 2 and 3 show the apparatus of figure 1 in side view. Figure 2 illustrates the position of the apparatus when the stack 10 is clamped on shingler roller 14; figure 3 when the stack has completely traversed shingler roller 14. These figures will be referred to below during the explanation of the operation of the invention.

Figure 4 illustrates a top view of the apparatus shown in figure 1 in the position shown in figure 3. Like reference numerals are used to indicate elements common to the figures. In figure 4, there are two link members 32 and associated clamp assemblies arranged at either end of pivot shaft 40. The position of link members 32 on shaft 40 are adjustable to accomodate paper of various widths.

Positioned intermediate of link members 32 on pivot shaft 40 is pivotable knife edge 60 which is operable to pick sheets after they have been separated. Knife edge 60 operates in a conventional manner and is shown for purposes of illustration only. It is also to be noted that sheets separated in accordance with the invention may then be fed in any direction.

It is contemplated that apparatus embodying the invention will operate to quickly and uniformly separate a stack of sheets prior to the beginning of any feeding to the utilization device, which may for example be a printer requesting sheets to be fed at an irregular rate.

Referring to figure 1, a stack of sheets 10 is manually placed as shown with respect to shingler roller 14.

Clamp assembly 18 is brought to its operative position shown in figure 2, manually or mechanically.

Rotation by means not shown of shingler roller 14 begins and the edges of the sheets in stack 10 are uniformly separated as the stack moves from bed 6 to bed 8 over shingler roller 14 while held in conformity therewith by clamp assembly 18.

5 Belt 20 is driven through stack 10 by shingler roller 14. The stack is separated when it has travelled to the position indicated in figure 3, and continuous rotation of shingler 14 ends.

Knife edge 60 is spring loaded down by means not shown and sheets are ready to be picked from the stack. Incremental rotation of shingler roller 14 permits knife edge 60 to pick to topmost sheet as its trailing edge springs up. Stated differently, further rotation of shingler roller 14 brings the topmost sheet out from under clamp assembly 18, into a position where knife edge 60 can pick it. Sheets so picked may be further transported in any direction by conventional means.

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While the invention has been particularly shown and described with reference to a particular embodiment, it will be understood by those skilled in the art that various changes in form and detail may be made without departing from the spirit and scope of the invention. In particular roller 14 may be mounted idle on shaft 16, and driving means may be provided to drive belt 20.

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CLAIMS

1. Apparatus for shingling sheets in a stack (10) comprising:

a roller (14), and

- 5 clamping means (18) to apply a force to said stack of sheets to bring a first end face of said stack into close contact with said roller,

characterized in that:

- 10 driving means are provided to drive said stack (10) between said roller (14) and said clamping means (18), and

said clamping means (18) are adapted to conform said stack (10) to a portion of the periphery of said roller.

- 15 2. Apparatus according to claim 1, characterized in that it comprises first and second stack supports means (6 and 8) arranged on either side of said roller (14), said first support means (16) being designed to receive the stack to be shingled, and said second stack support means (8) being designed to receive said stack after it
20 has been moved by said driving means between said roller (14) and said clamping means (18).

3. Apparatus according to claim 1 or 2, characterized in that:

- 25 said clamping means (18) comprise freely rolling means, and

means are provided to rotate said roller (14), said roller then constituting said driving means.

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4. Apparatus according to claim 3, characterized in that said freely rolling means comprise a belt (20) extending between at least two idle pulleys (22, 24) spaced from each other by a distance corresponding substantially to the length of said portion of periphery of said roller (14).
5. Apparatus according to claim 4, characterized in that said freely rolling means comprise a belt tensioning pulley (26) which is spring (36) loaded so as to allow the part of said belt extending between said two pulleys (22, 24) to remain in close contact with the second end face of said stack (10) when said stack conforms to a portion of the periphery of said roller (14).
6. Apparatus according to any one of the preceding claims, characterized in that:
- said clamping means (18) are mounted on a pivotable member (32),
- the axis (40) of said pivotable member is mounted on the apparatus frame (42) and
- spring means (44) are connected between said pivotable member and said frame (42) for biasing said clamping means (18) against said stack (10).
7. Apparatus according to claim 6, characterized in that:
- a cam shaft (48) is mounted on said frame (42) and
- said member (32) comprises cam means (46) designed to cooperate with said cam shaft (48) for holding said clamp means (18) away from said stack (10).

8. Apparatus according to any one of the preceding claims, characterized in that the friction coefficient of said roller (14) and of said belt (20) is higher than the friction coefficient between said sheets.
- 5 9. Apparatus according to any one of the preceding claims, characterized in that the size of said roller (14) is selected to control the desired degree of shingling.
10. Apparatus for shingling sheets in a stack (10) comprising a roller (14) having a high coefficient of friction relative to the sheets, characterized in that it
10 comprises:
- first and second stack support means (6, 8) arranged on either side of said roller (14),
- 15 clamping means (18) for holding the stack in arcuate conformity with said roller (14), and
- means for rotating said roller (14) for transporting said stack (10) from said first to said second stack support means (6, 8), whereby all said sheets are offset by a uniform amount.

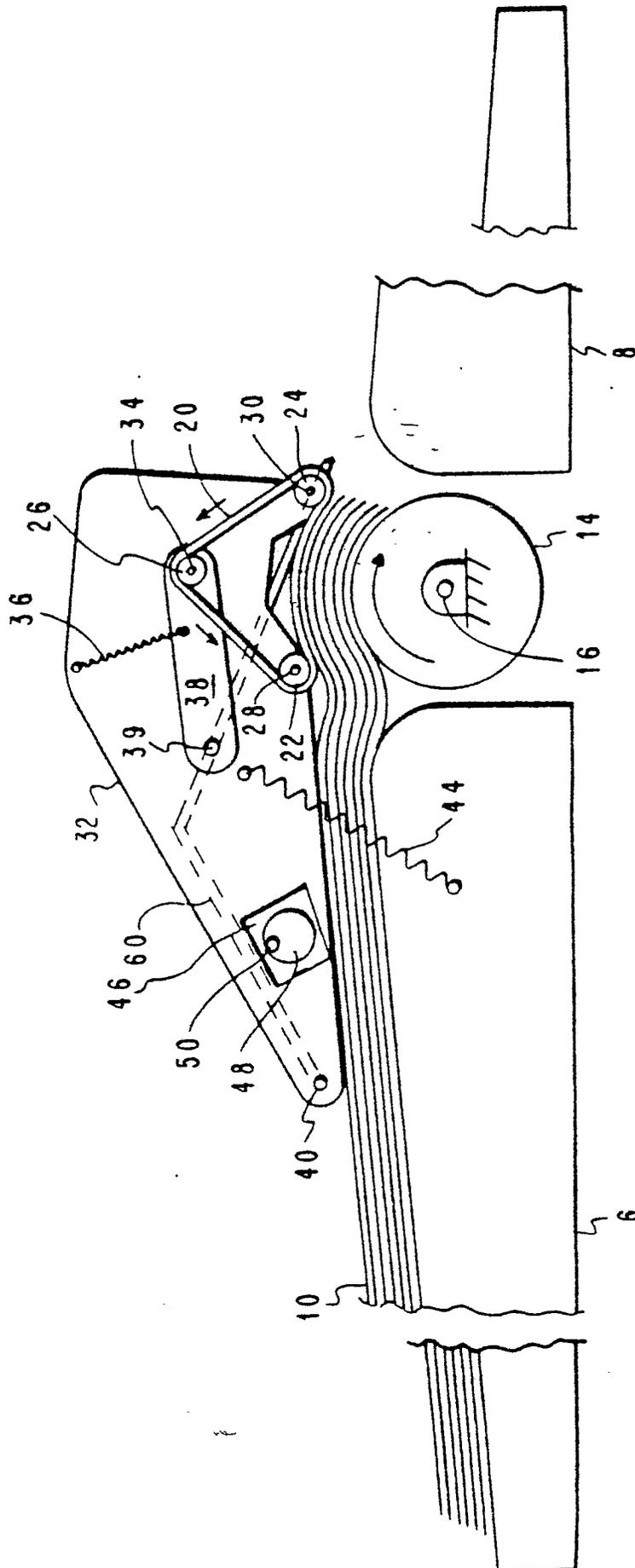


FIG. 2

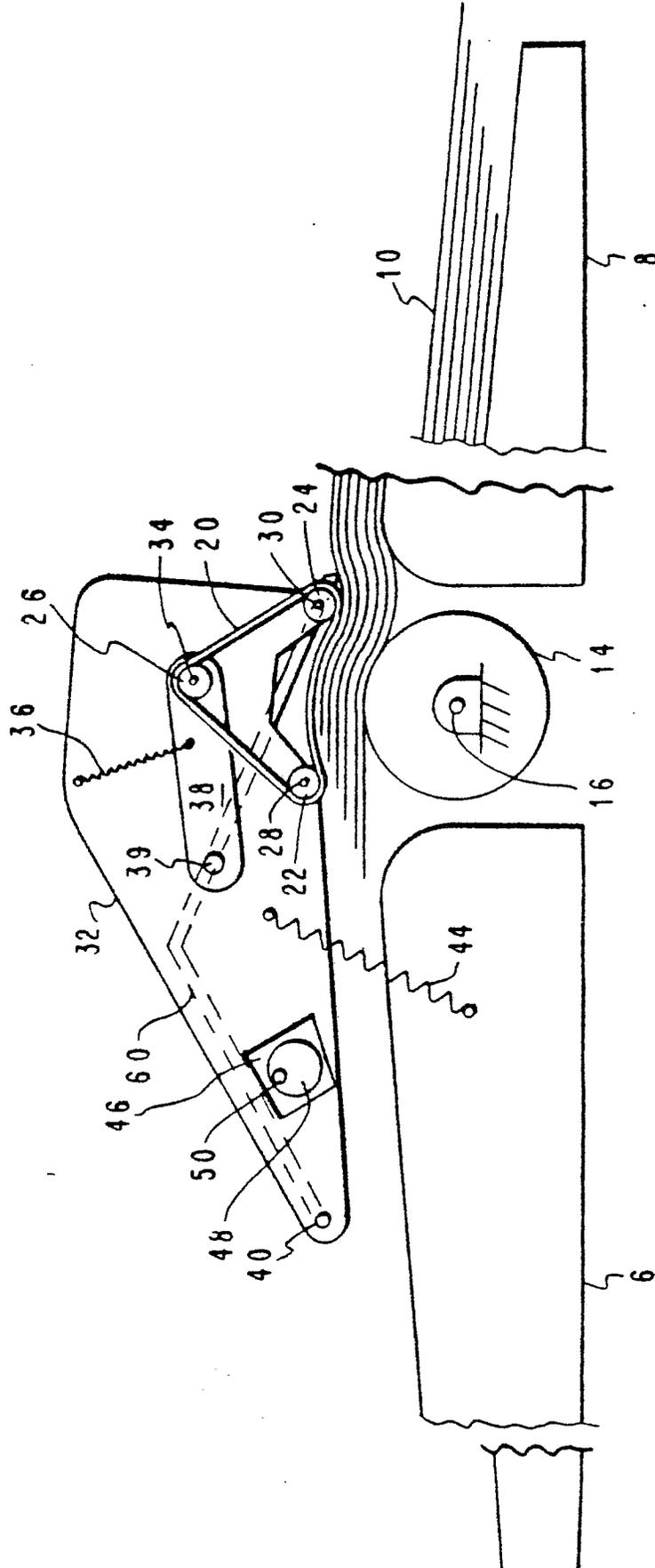


FIG. 3

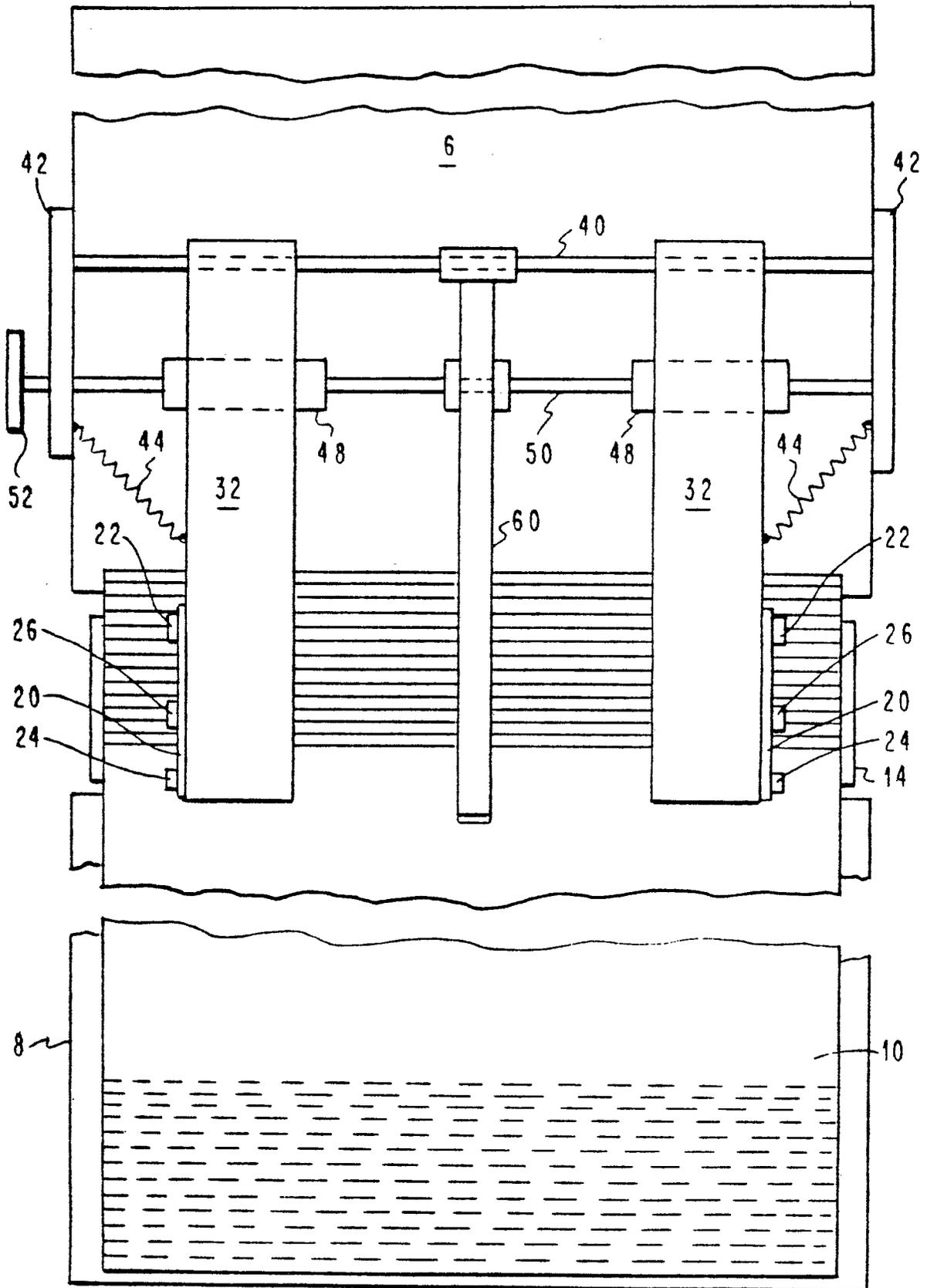


FIG. 4



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	
X	DE - B2 - 2 641 214 (W. STICHT) * column 4, lines 21 to 42 * ---	1-3, 10	B 65 H 3/60 B 65 H 3/06
A	DE - A1 - 2 639 677 (MASCHINENBAU OPPENWEILER GMBH) * claims 1 to 6 * ---		
A	FR - A1 - 2 353 466 (TRANSAC) * fig. 4 * ---	6	TECHNICAL FIELDS SEARCHED (Int. Cl.)
D,A	US - A - 3 008 709 (W.S. BUSLIK) * fig. 1, 2 * ---		B 41 J 13/00 B 65 H 3/00 G 06 K 13/00
A	FR - A - 537 882 (TORONTO TYPE FOUNDRY) * fig. 5 * -----		
			CATEGORY OF CITED DOCUMENTS
			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
			&: member of the same patent family, corresponding document
<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	
Berlin	25-09-1980	BITTNER	