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Method and apparatus for providing wire support for an electric lamp.

An electric lamp (10) having improved wire support features includes a light source (12) having leads (14) extending therefrom. The light source leads are connected to conductor wires (16,18) which are effective for providing conduction of energy to the light source and for providing a means to mechanically support the light source in an outer jacket. A support member (24) made of an electrically insulative material is connected between the conductor wires in order to control and define the geometry of the conductor wires during the manufacturing process and to enhance rigidity of the frame formed by the conductor wires thereby preventing damage to the light source as can occur under certain excessive forces caused by shock and vibration that are exerted on the light product. The support member is achieved by use of a resistor blank which is adaptable to high speed manufacturing operations at very cost effective values.

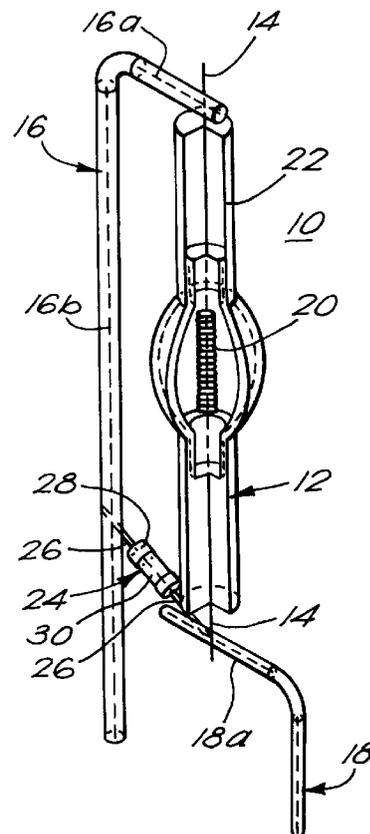


FIG.1.

FIELD OF THE INVENTION

This invention relates to a method and apparatus for providing wire support for an electric lamp and more particularly, for providing such a wire support arrangement which can utilize cost efficient components and can be easily manufactured by means of a high speed automated manufacturing process.

BACKGROUND OF THE INVENTION

There are numerous lighting applications where it is necessary to provide a means for insuring that the components of the lamp are protected from damage as may occur from vibration, shock and other external forces. Excessive forces on the light generating element of the lamp may cause shorting and thus the early failure of the lamp as for instance in the case of shorting between the filament turns of an incandescent lamp. In some situations, a wire frame may be provided which not only serves to support the light generating element but also provides for the conduction of power to the light source. An example of such a lighting application can be found in U.S. Patent No. 4,039,885 wherein it is disclosed that for a sealed beam incandescent lamp as may have use in vehicles, a bridge comprising an electrically insulating mass extending through two supporting wires is welded at four points between the conductors which supply power to the filament of the lamp. Though effective for providing a measure of protection against damage to the filament as may be caused by impact forces, the actual bridging element is specifically constructed for the very application of this sealed beam lamp and as such, is costly to implement and incorporate into the manufacturing process for assembling the lamp. Another example of an electrically insulating material being used as a spacer between two conductors of an incandescent lamp can be found in U.S. Patent No. 3,819,970. In this example, a specifically constructed spacer element is welded between two parallel oriented conductor leads which extend to the filament and provide power thereto. This example further provides for a glass insulator and a heat shield/insulator configuration which bridge across the two parallel oriented conductor wires along various points thereof for purposes including spacing, support and shielding. Similar to the previously cited reference U.S. 4,039,885, this example further utilizes a spacer member which is specifically manufactured for the use set forth and accordingly, has a higher cost associated therewith than would a component that could serve the same purpose along with various other purposes thereby making such component cost efficient due to mass production availability.

Therefore, it would be advantageous if a support and/or spacer arrangement for use with the conductor leads of an electric lamp could be provided that would

be significantly reduced in cost relative to the dedicated element currently used for this purpose. If a spacer/support device could be utilized that had significant other applications that would allow that such device be produced in mass quantities, thereby reducing the unit cost per element, such a device would be significantly reduced in price relative to an element which is specifically designed for the one purpose as described in the above discussed patents. Moreover, such a cost effective replacement for currently used spacer/support elements must be capable of implementation on a high speed automation manufacturing system in order to further enhance the cost saving potential of such an element.

In addition to serving as a support/spacer device for the conductors leading to a filament of an incandescent light source, it would be advantageous if the cost effective spacer/support device described above could be utilized for any type of light source including discharge light sources or light sources which utilize double ended lamp envelopes for containing the light generating means. U.S. Patent No. 5,019,743 issued to Olwert et al on May 28, 1991 and assigned to the same assignee as the present invention and incorporated herein by reference, is an example of a light source having a double ended lamp envelope with leads extending outwardly from each end and wherein these leads are welded to mount wires for support and conduction of power to the light generating means disposed in the lamp envelope. In such an environment, it is necessary that the spacer/support device not only maintain the spacing between the mount wires as in the situation of parallel disposed conductor wires as illustrated in the previously discussed two patents, but where the light generating arrangement includes a lamp envelope having significantly greater weight than an incandescent filament, it is also necessary that the spacer/support arrangement provide a greater amount of support and prevent twisting or other movement of the lamp envelope away from the axis on which it is originally mounted. This is particularly important where such a lamp envelope or arc tube as in the case of a discharge light source, is disposed in a reflector or parabolic lamp that requires that the light source maintain its proper positioning within the reflector portion of that lamp in order to insure that the optical characteristics of that reflector or parabolic lamp are accurate.

It has also been observed that in lamp products having a lamp envelope mounted on conductor wires which comprise a wire frame support arrangement as illustrated in the above-discussed U.S. Patent No. 5,019,743, the bottom portions of the conductor wires that are to be mounted in the reflector and base assembly, must be maintained in the precise spaced apart relation necessary to align with the slots in a screw base portion. Without an added support arrangement between the two conductor wires, it is pos-

sible that the bottom portions would bend or twist thereby making it difficult to achieve final lamp assembly in a high speed automated process. Therefore, it would be further advantageous if an electric lamp having an improved wire support arrangement could be provided that would maintain the appropriate spatial relation between the bottom portions of the conductor wires so that a high speed automated assembly operation could be utilized.

SUMMARY OF THE INVENTION

It is therefore a feature of the invention to provide an electric lamp having a wire supporting arrangement for use with the conductor leads to a light source which can be procured at a very cost effective price and can be implemented in a high speed automated manufacturing operation. A further feature of this invention to provide such a supporting arrangement which can be equally effective in use with various types of light sources including incandescent, discharge and light sources employing arc tubes as well as those disposed in reflector lamps, PAR lamps and general A-line lamps.

In accordance with the principles of the present invention, there is provided an electric lamp having an improved wire support arrangement having at least two conductor wires which function both to provide electrical power to the lamp and to support the light source within the lamp. The support member arrangement of the present invention will extend between pairs of the conductors and provide a mechanical support so as to proven significant movement of the conductor wires relative to one another. The support member is achieved by use of an electrically insulative device connected between the conductor wires leading to the light source. In order to attain the stated cost savings and ability to be implemented in a high speed automated manufacturing operation, this support member is provided for by means of a resistor blank which can be installed in an assembly line operation in the form of a spool of such elements. The spool of resistor blanks is particularly cost efficient due to the fact that completed spools of resistors are used on a widespread basis in the electronics industry as for instance in the assembly of printed circuit boards which go into various electronic products. By utilizing a widely available and cost effective product, the spool of resistor blanks offers a significant cost savings over those devices presently used in the lamp art for the purposes of support and energy conduction to the light source and further, lends itself to a high speed manufacturing operation similar to that used in the electronic product assembly market.

By utilizing a widely available component that is readily adaptable to a high speed automated manufacturing process, the present invention achieves advantages over the previous approaches to providing

additional support to the light source, conductor wire configuration. This is particularly true by the use of resistor blanks which are even more cost effective that would be fully manufactured spools of resistor elements. This is so since the use of resistor blanks is more cost effective given that this use treats the blank resistor as an end product even before it has been subjected to the metal oxide film coating process which is typically used to set the resistive values of the completed spools of resistors.

BRIEF DESCRIPTION OF THE INVENTION

In the following detailed description, reference will be made to the attached drawings in which:

Fig. 1 is an elevational view in section of an electric lamp having an improved mounting arrangement and constructed in accordance with the principles of the present invention.

Fig. 2 is an elevational view of a manufacturing assembly line capable of implementing the high speed manufacturing operation of the electric lamp as illustrated in fig. 1.

Fig. 3 is an elevational view of a station for supplying and welding the support members to the assembly line as illustrated in fig. 2.

DETAILED DESCRIPTION OF THE INVENTION

As seen in fig. 1, the electric lamp 10 having an improved wire support arrangement and which is constructed in accordance with the principles of the present invention, includes a light source 12 having leads 14 extending outwardly therefrom. L-shaped conductor wires 16, 18 are shown connected to the leads 14 and are effective for providing conduction of the energy to the light source 12 and for supporting the light source 12 within the electric lamp 10. As illustrated, the light source 12 is an incandescent light source having a filament 20 disposed within a double ended quartz lamp envelope 22 and mounted between parallel base portions 16a and 18a of the L-shaped conductor wires 16, 18. The filament 20 is constructed having a plurality of filament turns and as such, it is known that, should excessive forces be exerted on the electric lamp 10, the filament turns could be shorted between one another thereby causing a premature lamp failure. Although the present invention is illustrated in conjunction with an incandescent light source 12 having a lamp envelope 22 disposed around a filament 20, it should be understood that the improved wire support arrangement of the present invention would be equally effective with other light sources constructed in various manners as well. It is intended that the present invention apply equally to discharge light sources having arc tubes as well as other types of incandescent light sources in which an lamp envelope is not utilized; that is, a bare

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filament is utilized. Additionally, with the light source 12 disposed within an lamp envelope 22 as illustrated, the electric lamp 10 can be utilized in a reflector or PAR type of lamp as shown in the previously discussed U.S. Patent No. 5,019,743 which has been incorporated by reference. In this type of application, it is essential that the lamp envelope maintain its alignment with the longitudinal axis of the reflector or PAR lamp in order to insure that the optical characteristics of such lamp remain accurate. It is known that because the light source 12 is disposed in the lamp envelope 22, additional support is needed to maintain the positioning and integrity of the light source than that which would be required for a light source employing merely an incandescent filament.

In order to prevent lamp failure or optical misalignment conditions as previously described, in the electric lamp 10 as shown in fig. 1, a support member 24 is connected between the conductor wires 16, 18 at a point spaced apart from where the leads 14 are connected to the conductor wires 16, 18. The support member 24 must be made of an electrically insulative material so that a short circuit does not occur between the two conductor wires 16, 18. For this purpose, the support member 24 is realized by use of a resistor blank which is constructed having a ceramic center portion and two lead wires 26 extending from end caps 28 disposed on either side of the ceramic center portion. The resistor blank element serving as the support member 24 is one that is commonly utilized in the manufacture of various resistor components used in the production of electronic products. Typically, the resistor core is put through a further manufacturing process to obtain the various resistive values that are needed for the electronic circuits on which the resistors are mounted. For the purposes of the present invention however, this final manufacturing step is eliminated thereby making the cost of such element even less than the typical resistor used for electronic product assembly. Additionally, since the resistor elements that are used on electronic product assembly are installed using a high speed automation arrangement, the resistor blanks are obtainable in large quantities at very reasonable costs and already configured to be used on an high speed automation system by virtue of being supplied on a spool arrangement 52 as illustrated in fig. 3.

Although conductor wires 16, 18 are illustrated as being L-shaped in configuration, it should be realized that the advantage of the present invention in terms of component cost advantage and adaptability to high speed automation, can also be realized for the parallel straight conductor wires typically used in lamps such as are described in the previously described U.S. Patent Nos. 3,819,970 and 4,039,885.

For a light source 12 mounted in a reflector or PAR lamp, conductor wires 16, 18 can be bent into the L-shaped configuration whereby first conductor wire

16 is longer and constructed of a heavier gauge metal than the second conductor wire 18. Since it is known that the light source 12 having the lamp envelope 22 construction is heavier and therefore requires additional support over the light source utilizing merely an incandescent filament, the support member arrangement 24 must be effective to help isolate the light source 12 from the adverse affects of shock or vibration caused by the exertion of excessive forces on the lighting product, as can occur for instance in the case of an automotive sealed beam headlamp or in the mishandling of a PAR type of lamp. The support member 24, as shown in fig. 1, is welded on one end between the end region of the base portion 18a of the smaller gauge conductor wire 18 and, on the other end, to the back portion 16b of the larger gauge conductor wire 16. The mounting of support member 24 is preferably done at an angle as illustrated in fig. 1 thereby allowing for a less precise operation in positioning the support member prior to the welding operation. However, a straight orientation between the base portion 18a of the smaller gauge conductor wire 18 and the support member 24 can be equally effective as well. In either situation, the support member 24 of the present invention insures that the spacing between the respective back portions 16b, 18b of the conductor wires 16, 18 are maintained in a fixed relation so that the overall electric lamp 10 having the improved wire support arrangement can be easily installed in a reflector or other type of outer lamp, screw base arrangement by way of a high speed automated manufacturing operation. Further to the purpose of providing increased support, the resistor blank that comprises support member 24 is selected so that the center portion 30 is large relative to the lengths of the core leads 26 thereby providing for a more rigid structure.

The manufacture of the electric lamp 10 shown in fig. 1, is accomplished by means of a high speed automated manufacturing process as illustrated representationally in fig. 2. The manufacturing system 40 can include a conveyor belt portion 42 which proceeds past a number of stations 44 at which various lamp construction operations are performed. For a detailed discussion of the steps of such an operation, reference is hereby made to U.S. Patent No. 5,087,218 issued to Ahlgren et al on February 11, 1992, issued to the same assignee as the present application and herein incorporated by reference. For example, stations 44 can perform the functions of inserting the filament 20 into the lamp envelope 22 and welding conductor wires 16, 18 to leads 14 of the light source 12. Station 50 disposed along conveyor belt 42 performs the function of selectively advancing a single support member 24 into the loaded position for each light source 12, conductor wire 16, 18 configuration completed to that stage. The station 50 can be further effective for performing the operation of weld-

ing support member 24 to the conductor wires 16, 18 in the orientation previously described. Also illustrated in fig. 2, is a station 46 which can perform the function of inserting the electric lamp 10 having the improved wire support arrangement of the present invention into a reflector assembly of other outer bulb configuration having a screw base portion for allowing insertion of the completed lamp assembly into a light fixture (not shown).

As seen in fig. 3, the station 50 which supplies the support members 24 to the high speed automation system of fig. 2, includes a spool 52 having contained thereon, a large supply of the support members 24. Additionally, a welding function is also performed at station 50 by means of a welding device 54 which can form a part of station 50.

Although the above described embodiment constitutes the preferred embodiment of the invention, modifications can be made thereto without departing from the scope of the invention as set forth in the appended claims.

Claims

1. An electric lamp having an improved wire support arrangement comprising:
 - a light source having leads extending therefrom;
 - conductor wires connected to said leads of said light source effective for conducting energy to said light source;
 - an electrically insulative support member connected between said conductor wires and being effective so as to substantially reduce relative movement between said conductor wires; and
 - wherein said support member is a resistor blank having an electrically insulative center portion and core leads extending from opposite ends thereof.
2. An electric lamp as set forth in claim 1 wherein said light source is an incandescent light source and said conductor wires are two conductor wires each of which is connected to one end of an incandescent filament portion of said incandescent light source.
3. An electric lamp as set forth in claim 2 wherein said support member is connected to said two conductor wires in a region where said two conductor wires are oriented relative to one another in a non-parallel manner.
4. An electric lamp as set forth in claim 1 wherein said light source is disposed in a lamp envelope having said leads extending therefrom for connection to said conductor wires.
5. An electric lamp as set forth in claim 4 wherein said lamp envelope is a double ended quartz lamp envelope having said light source disposed therein and said leads extending from opposite ends thereof, said double ended quartz lamp envelope being oriented in a manner so that the longitudinal axis thereof is disposed in a parallel manner relative to a substantial portion of one of said conductor wires.
6. An electric lamp as set forth in claim 4 wherein said conductor wires are two conductor wires and said support member is connected to said two conductor wires in a region where said conductor wires are oriented in a non-parallel relation to one another.
7. An electric lamp as set forth in claim 4 wherein said conductor wires are two conductor wires which are bent in an L-shaped configuration and are disposed relative to one another so that respective base portion of said L-shaped conductor wires are parallel to one another and have said lamp envelope mounted therebetween, and further wherein said L-shaped conductor wires have respective back portions, which when said lamp envelope is mounted therebetween, are also disposed in a parallel relation to one another.
8. An electric lamp as set forth in claim 7 wherein said support member is welded at an angle between said base portion of one of said conductor wires and said back portion of the other of said conductor wires.
9. An electric lamp as set forth in claim 4 wherein said lamp envelope of said light source is disposed along the central axis of a reflector lamp.
10. An electric lamp as set forth in claim 6 wherein said center portion of said resistor blank is sized relative to said core leads so that the respective lengths of said core leads which are connected in a non-parallel relation to said conductor wires, are minimized.
11. A method of constructing an electric lamp having an improved wire support arrangement using a high speed automated manufacturing operation, said lamp construction method comprising the steps of:
 - assembling a light source configuration having lead wires extending therefrom;
 - connecting conductor wires to the lead wires of the light source so as to allow energization of the light source;
 - selectively taking one electrically insulative support member from a spool of substantially

similar elements and connecting the selected support member between the conductor wires at a position spaced apart from where the conductor wires connect to the lead wires of the light source, and

wherein said step of selectively taking said support member from a spool of similar elements includes advancing a spool of resistor cores so that one of said resistor cores can be welded between the conductor wires in a high speed manner.

12. A lamp construction method as set forth in claim 11 further comprising the steps of:

assembling the light source into a lamp envelope having the lead wires extending from opposite ends thereof;

bending the conductor wires into an L-shaped configuration so that the lamp envelope can be mounted between parallel oriented base portions of the respective conductor wires; and

mounting the support member at an angle between non-parallel portions of two of the conductor wires.

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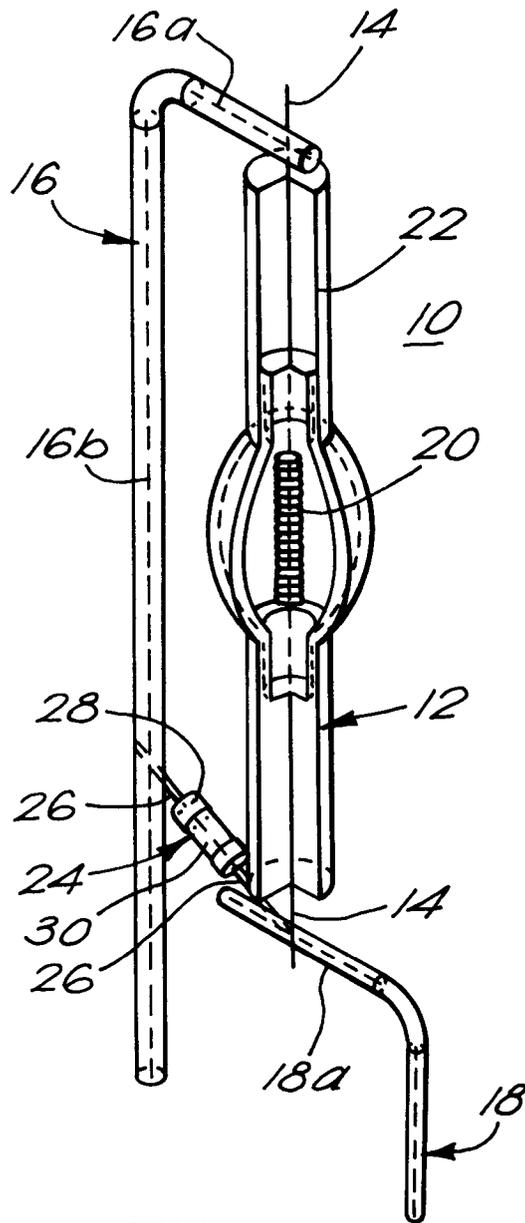
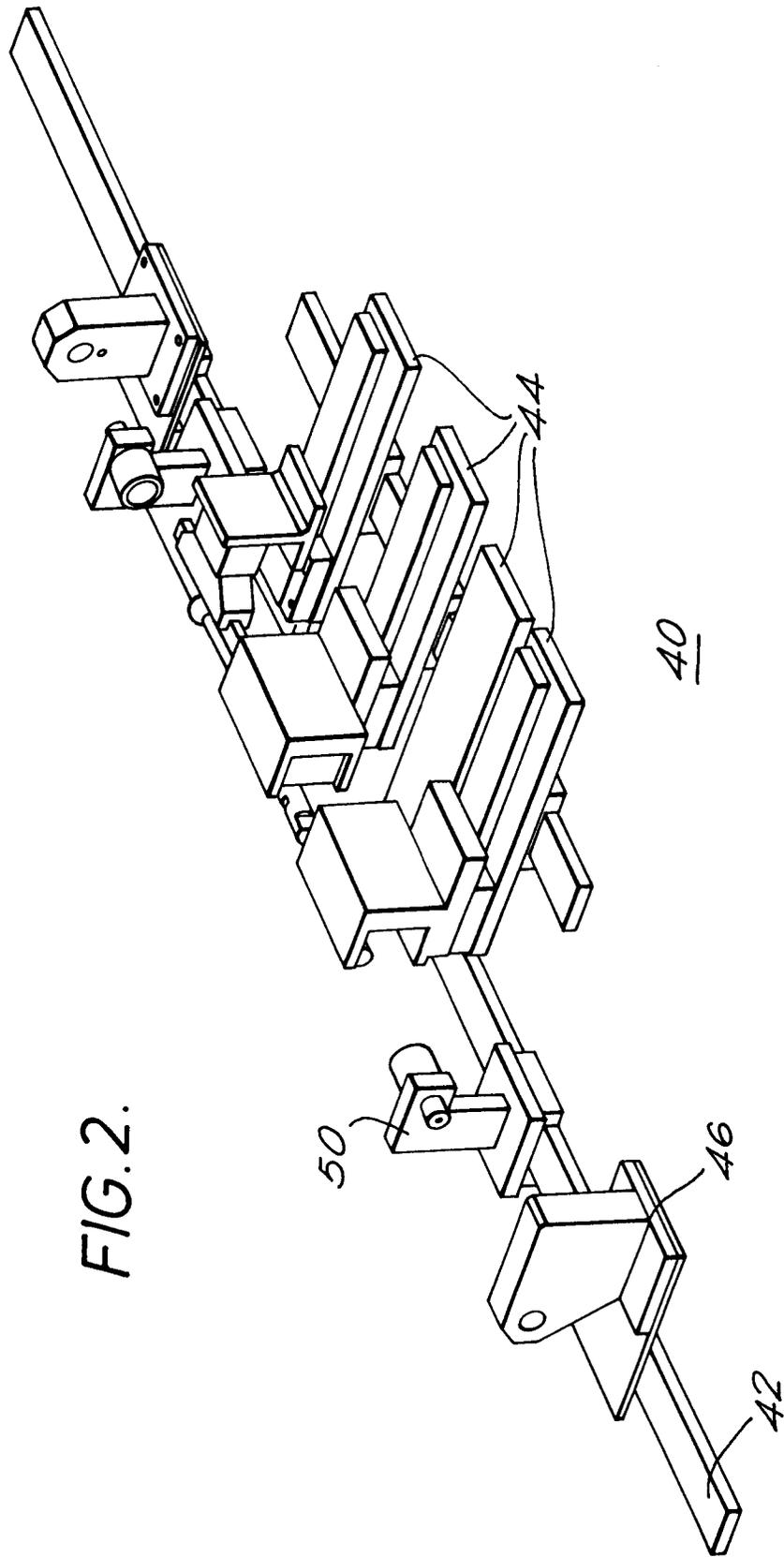


FIG.1.



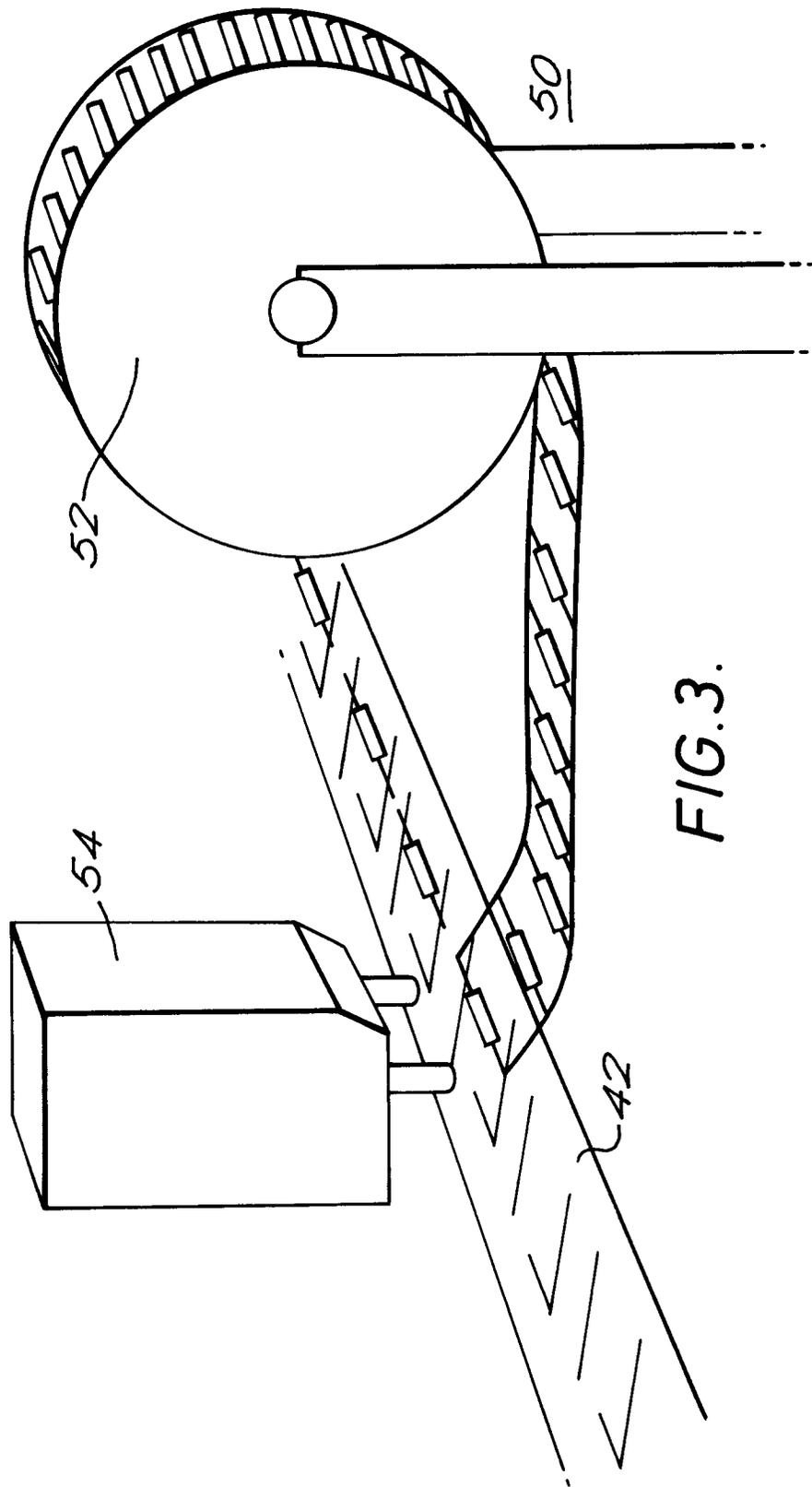


FIG.3.



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 0178

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	EP-A-0 429 256 (GENERAL ELECTRIC COMPANY) * page 2, paragraph 1 * * page 3, line 5 - line 11 * * page 3, line 37 - line 52; figure 1 * ---	1,2,4,5, 7,9	H01K1/18 H01J5/50
A	GB-A-2 234 628 (KOITO MANUFACTURING) * abstract * * page 3, line 18 - page 4, line 17; figures 1-3 * ---	1,4,5,7	
A	US-A-3 502 931 (MOSBY) * column 1, line 25 - line 31 * * column 1, line 47 - column 2, line 16; figure 1 * ---	1,3,8,10	
A	US-A-3 114 069 (PEEK ET AL.) * column 1, paragraph 1 * * column 2, line 52 - line 70; figure 1 * -----	1,2,8,10	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			H01K H01J
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 March 1994	Examiner Greiser, N
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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