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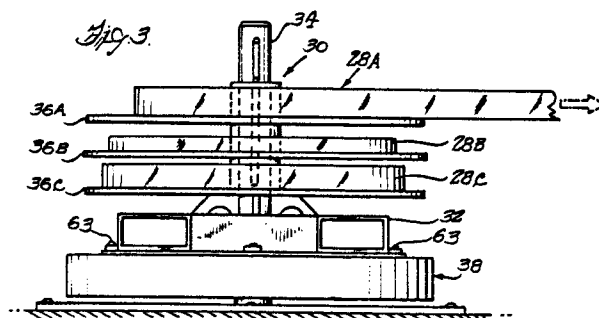
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54 **Apparatus for handling rolls of flat cable.**

57 The apparatus of the present invention includes a carrier assembly (32) for mounting on a turntable - (38) which is rotatable in a substantially horizontal plane. The carrier assembly (32) includes a horizontal support surface and further has a vertical shaft - (34) extending above the support surface. A number of roll supports each have a generally centrally located aperture for receiving the vertical post (34) so that the roll supports (36) can be stacked on the carrier assembly. Each of the roll supports (36) has a support surface, with the support surfaces being generally horizontally positioned when the roll supports are stacked on the carrier assembly (32). The apparatus also includes a number of spacer hubs - (70) with one hub associated with each roll support. Each hub (70) has a central opening for receiving the vertical shaft (34) and each hub is positioned between its corresponding roll support and the next upwardly disposed roll support. The vertical length of each hub (70) is at least slightly greater than the width of the roll of flat cable (28) supported by the corresponding roll support so that each roll of flat cable (28) does not support the weight of any other roll and the weight of the roll is distributed on a side thereof to reduce localized compression of material forming the roll. Also disclosed is a method of dispensing flat cable (28) using this apparatus (30).



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APPARATUS FOR HANDLING ROLLS OF FLAT CABLE

The subject invention relates to apparatus for forming and dispensing and, more specifically, relates to apparatus for use in forming rolls of flat cable for storing and transporting the rolls and for paying out the cable making up the roll.

Background of the Invention

Flat cable, wherein a number of conductors are held in generally parallel, coplanar relationship in a layer of insulation, has come into increasing use because of its usability with mass termination, insulation displacement connectors, resulting in appreciable savings of time and expense over previous methods of wiring requiring individual stripping and termination of each conductor. With the introduction and continuing improvement of high speed automated equipment for manufacturing, cutting and terminating flat cable, there is a need for rolls of flat cable of great capacity.

Known methods of handling packages of flat cable are not well suited for these new rolls of increased size and weight because the known methods entail supporting the entire weight of the roll on a small portion of the cable. This results in localized stress concentration which can permanently deform and, in an extreme situation, break components of the cable. This is especially of concern when the cable includes relatively delicate components, having parameters smaller than those of the main conductors, such as drain wires, foil or mesh shields, ground planes and optical fibers. Not only does such deformation present an unsatisfactory appearance, it also results in alteration of the desired spacing of the conductors so that they no longer match the spacing of the terminal elements held in the mass termination connector, which may result in failure to terminate all conductors.

More specifically, it is known to support a flat cable roll 20 on a horizontal shaft 22 as shown in prior art FIG. 1. Here the entire weight of the roll is supported on the cable portion indicated by arrow "A", directly above the shaft causing compression of that small portion. Referring to prior art FIG. 2, it is also known to place a flat cable roll 24 on a horizontal support 26. Again the entire weight of the roll compresses a small portion of the cable - (designated by arrow "B"), here located at the bottom of the roll.

Summary of the Invention

Among the several aspects and features of the present invention may be noted the provision of improved apparatus for handling rolls of flat cable. The apparatus supports the rolls in a horizontal disposition so that their weight is distributed over an entire side of the rolls. The apparatus carries rolls in stacked relationship for dense packaging but prevents a given roll from being subjected to more than its own weight. Each roll is rotatable so that flat cable can be taken up or payed out. Furthermore, components of the apparatus for holding a roll are reusable in that after a roll is exhausted at a consumer facility, the component can be returned to the cable manufacturing plant for winding of another roll. The flat cable handling apparatus of the present invention is reliable in use, has long service life and is simple and economical to manufacture. Other aspects and features of the present invention will be, in part, apparent and, in part, pointed out hereinafter in the following specification and accompanying claims and drawings.

Briefly, the apparatus of the present invention for use in forming rolls of flat cable, for use in storing and transporting the rolls, and for use in paying out cable from the rolls, includes a carrier assembly, a plurality of roll supports and a plurality of spacer hubs with one hub associated with each roll support. More specifically, the carrier assembly is adapted to be mounted on a turntable with the carrier assembly including a substantially horizontal support surface and further including a substantially vertical shaft extending above the support surface. Each roll support has a generally centrally located aperture for receiving the vertical post so that the roll supports can be stacked on the carrier assembly and each roll support has a roll support surface. The support surfaces are generally horizontally disposed when the roll supports are stacked on the carrier assembly. Each hub has a central opening for receiving the vertical shaft and each hub is disposed between its corresponding roll support and the next upwardly disposed roll support. Each hub has a vertical length at least slightly greater than the width of the roll of flat cable supported on the corresponding roll support so that each roll of flat cable does not support the weight of any other roll and the weight of that roll is distributed on a side of the roll to reduce localized compression of material forming the roll.

As a method of dispensing flat cable using this apparatus, the present invention includes several steps:

(a) A plurality of roll supports are mounted by vertically stacking them on the carrier assembly with each support having a surface carrying a roll of flat cable.

(b) The cable is payed out from one of the rolls until that roll is exhausted; and

(c) The empty roll support is removed from the shaft and replaced with another roll support having a fresh roll of flat cable.

Brief Description of the Drawings

FIG. 1 is a perspective view of a prior art mounting scheme in which a roll of flat cable is held on a horizontal shaft resulting in compressive forces being applied to a small portion of the cable;

FIG. 2 is a perspective view of another known support arrangement in which an upright flat cable roll is disposed on a horizontal support surface, again resulting in compressive forces being applied to a small portion of the cable;

FIG. 3 is a front elevational view of apparatus for handling rolls of flat cable embodying various features of the present invention, illustrating a cable from a roll being payed out;

FIG. 4 is a front elevational view of a carrier assembly for the apparatus of FIG.3;

FIG. 5 is a plan view of the carrier assembly;

FIG. 6 is an enlarged plan view of an interlocking component of the carrier assembly;

FIG. 7 is a plan view of one of several roll support flanges, each including a spacer hub, used in the apparatus of FIG. 3;

FIG. 8 is a side elevational view of the flange and spacer hub of FIG. 7; and

FIG. 9 is an enlarged end view of a flat cable usable with the apparatus of FIG. 3.

Corresponding reference numbers indicate corresponding components throughout FIGS. 3-8.

Description of the Preferred Embodiment

Referring now to the drawings, apparatus of the present invention for use in forming rolls of flat cable 28, for use in storing and transporting the rolls, and for use in paying out cable from the rolls, is generally indicated in FIG. 3 by reference character 30. The apparatus 30 includes a carrier assembly 32 having a vertical shaft 34 on which a plurality of flange assemblies or roll supports 36, each holding one of the rolls of flat cable, are mounted in stacked relationship. The post 34 and the flange assemblies include interlocking means so that all will rotate together. The carrier assembly 32 is adapted for attachment on turntable means rotatable in a substantially horizontal plane, such as

the rotary table 38 shown in FIG. 3. The rotary table 38 could either be driven, as when the apparatus 30 is used for winding flat cable rolls, or the table could be free to rotate, as when the apparatus 30 is used to pay out cable to automated equipment which pulls the cable resulting in rotation of the table 38. A more complex table which is driven but has a freewheeling capability could selectively provide both the winding and pay out functions. Such rotary tables are well known to those of skill in the art and need not be further described herein.

Referring to FIG. 9, an exemplary flat cable 28 includes a plurality of generally parallel, spaced conductors 40 held in coplanar relationship in a layer of flexible, electrically insulative material 42. The layer could be extruded with the conductors embedded therein, or the conductors could be sandwiched between upper and lower insulative sheets laminated together to form the layer 42. One side 44 of the cable could be flat with the other side 46 being provided with regularly spaced, longitudinally extending locating ribs 48 for properly positioning the conductors 40 in alignment with insulation displacement terminal elements in a mass termination connector. The cable could also include other components such as drain wires, foil or braid shielding, a ground plane and optical fibers.

More specifically, as best shown in FIGS. 4 and 5, the carrier assembly 32 includes a lower plate 50 with the post 34 extending upwardly at the center of the plate. Interconnecting the post and the base plate are four spaced radially extending vertically disposed plates 52 which have upper surfaces 54 forming a support surface for the lowermost flange assembly 36. Disposed outwardly from the vertical plates 52 are reinforcing means in the form of rectangular tube sections 56. The post 34, vertical plates 52 and tube sections 56, all preferably formed of steel, are welded to one another and to the steel base plate 50 to provide a strong, rigid structure. Disposed at the periphery of the lower plate are spaced mounting lugs 58 with the mounting lugs and lower plate having aligned apertures 60, 62, respectively, for receiving bolts 63 for attaching the carrier assembly 32 to the rotary table 38. The lower surface of the base plate 50 may include an annular groove 64 for receiving an annular rib on the rotary table, to properly locate the carrier assembly 32 with respect to the table 38. As best shown in FIG. 6, the interlocking means comprises a pair of diametrically opposed, axially extending keys 65 bolted to extend from the outer surface of the vertical post 34.

Referring to FIGS. 7 and 8, each flange assembly 36 or roll support, includes a generally circular flange 66 having a diameter greater than the diameter of the flat cable roll 28 it supports, and has a central opening 68. A hub 70, having a central opening 72 for slidably receiving the vertical post 34, is attached to each flange. Preferably both the flanges 66 and the hubs 70 are formed of aluminum. More specifically, each hub has a dependent sleeve 74 extending into the central aperture 68 of the flange. The hub and corresponding flange may be connected by means of spaced, peripherally located screws 76. The surface of the hub defining the opening 72 has spaced axially extending keyways 78 for receiving the keys 65 carried on the vertical post to interlock the flange assemblies 36 and the carrier assembly 32 so that they rotate together. The upper surface 80 of the flange supports one side of a roll 28 and each hub 70 has an axial length at least slightly greater than the width of the roll of flat cable 28 to be supported by the corresponding flange 66. Furthermore, each hub 70 includes a slot 82 extending from adjacent the hub opening 72 to the periphery of the hub for receiving a cable end to facilitate winding of the flat cable roll 28. Preferably, the slot does not extend radially but is canted with respect to the axis of the hub to trap the leading end of the roll so that the leading end does not pull out of the slot as the flange is rotated in the take-up direction indicated in FIG. 7.

It will be appreciated that when a plurality of the flange assemblies 36 are stacked on the carrier assembly 32 as shown in FIG 3, the flat cable rolls 28 each support only their own weight and that weight is distributed along an entire side of the roll. The length of the hub 70, being somewhat greater than the width of its corresponding cable roll 28, results in the hubs 70 supporting the weight of the flange assemblies 36 and flat cable rolls 28 disposed above them in the stacked arrangement. After one of the rolls is payed out until it is exhausted, the flange assemblies thereabove can be lifted off the shaft 34 and the flange assembly with its roll exhausted shipped back to the cable manufacturing facility for rewinding of a fresh roll.

As a method of dispensing flat cable, the present invention includes several steps:

- a) A number of flange assemblies 36 are vertically stacked on the carrier assembly 32;
- b) Cable from one of the supported rolls is payed out until it is exhausted; and
- c) The empty flange assembly is removed from the vertical post 34 and replaced with another flange assembly carrying a fresh roll of flat cable.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Claims

1. Apparatus for use in forming rolls of flat cable, for use in storing and transporting the rolls, and for use in paying out cable from the rolls, said apparatus comprising: a carrier assembly adapted to be mounted on turntable means rotatable in a substantially horizontal plane, said carrier assembly including a substantially horizontally disposed support surface and further including a substantially vertical shaft extending above said support surface; a plurality of roll supports with each support having a generally centrally located aperture for receiving said vertical post so that the roll supports can be stacked on said carrier assembly, each roll support comprising a planar roll support surface, the roll support surfaces being generally horizontally disposed when said roll supports are stacked on said carrier assembly; a plurality of spacer hubs with one hub associated with each roll support, each hub having a central opening for receiving said vertical shaft, each hub being disposed between its corresponding roll support and the next upwardly disposed roll support, each hub having a vertical length at least slightly greater than the width of the roll of flat cable supported on the corresponding roll support and with that roll wound around its corresponding hub, whereby an underlying roll of flat cable does not support the weight of any roll disposed above it.

2. Apparatus as set forth in Claim 1 wherein said vertical post is fixed on said carrier assembly so as to rotate therewith, said apparatus further including interlocking means for causing said roll supports and said hubs to rotate with said post.

3. Apparatus as set forth in Claim 2 wherein said interlocking means comprises a vertically extending key carried by said post, each hub having a keyway adjoining the central opening of said hub.

4. Apparatus as set forth in Claim 1 wherein each hub is attached to its corresponding roll support.

5. Apparatus as set forth in Claim 4 wherein each hub comprises a dependent sleeve extending into the aperture of said corresponding roll support.

6. Apparatus as set forth in Claim 5 wherein said roll support is a substantially round plate having a diameter greater than the diameter of the roll

it supports, the length of said sleeve being substantially equal to the thickness of said plate so that said plate and sleeve are coterminus.

7. Apparatus as set forth in Claim 1 wherein said carrier assembly comprises a plurality of upstanding plates connected to said vertical shaft, said support surface including upper surfaces of said plates.

8. Apparatus as set forth in Claim 7 wherein said carrier assembly further comprises a bottom plate and reinforcing means disposed on said bottom plate and at least partially surrounding said upstanding plates with said plates being interconnected between said reinforcing means and said vertical post.

9. Apparatus as set forth in Claim 8 wherein said reinforcing means include sections of tubing.

10. Apparatus as set forth in Claim 4 wherein each hub includes a slot extending from adjacent the central opening to the periphery of the hub for receiving a cable end to facilitate winding of the corresponding roll.

11. A method of dispensing flat cable using a carrier assembly mounted on a turntable rotatable in a substantially horizontal plane, said carrier assembly including a substantially horizontally disposed support surface and a substantially vertical shaft extending above said support surface, said method comprising the following steps:

(a) mounting a plurality of roll supports in vertically stacked relationship on said carrier assembly, each roll support including a roll support surface carrying a roll of flat cable, and a hub having a central opening for receiving said vertical shaft, said hub extending above said roll support surface a distance at least slightly greater than the width of the flat cable of the roll on that roll support, the hub of a lower roll support engaging the next upper roll support;

(b) paying out cable from one of said rolls until said roll is exhausted;

(c) removing the empty roll support from said shaft and replacing it with another roll support having a fresh new roll of flat cable.

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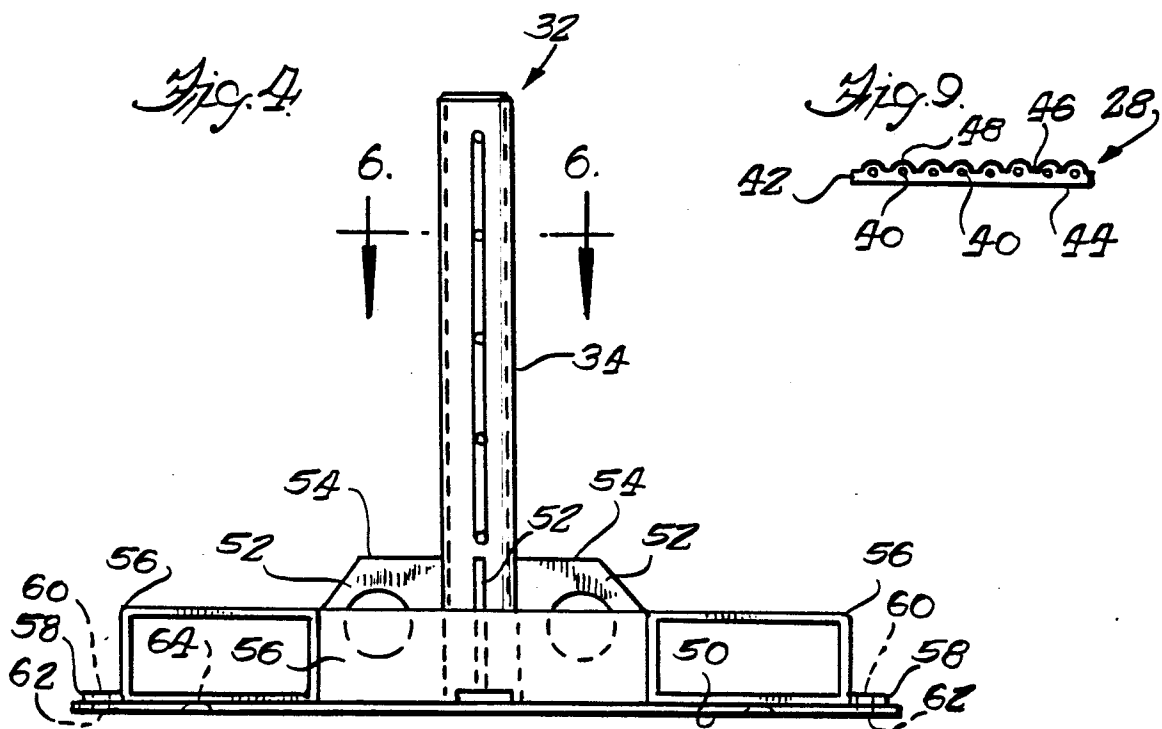
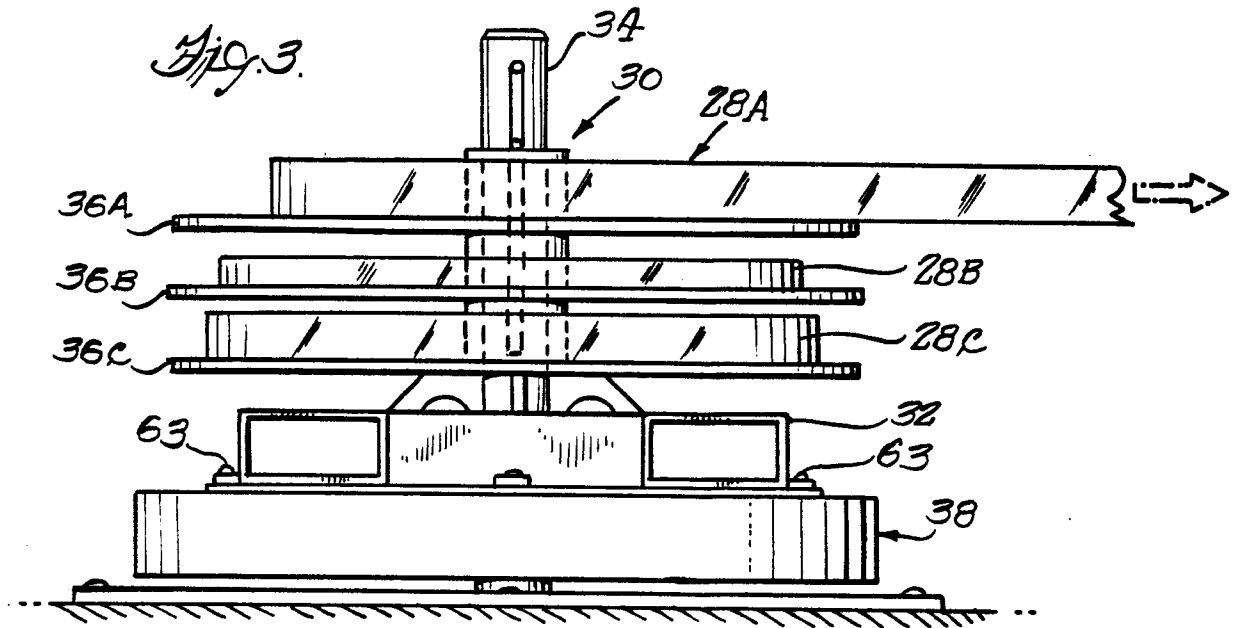
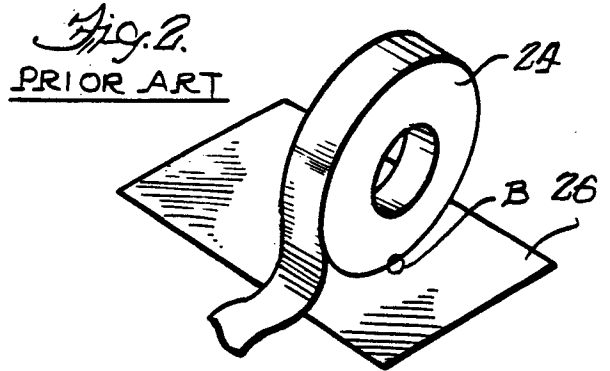
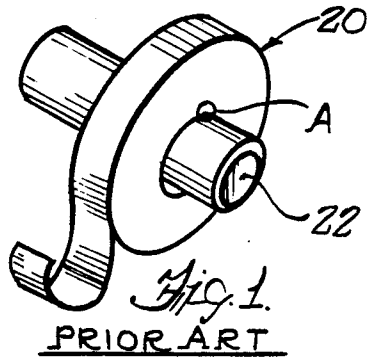
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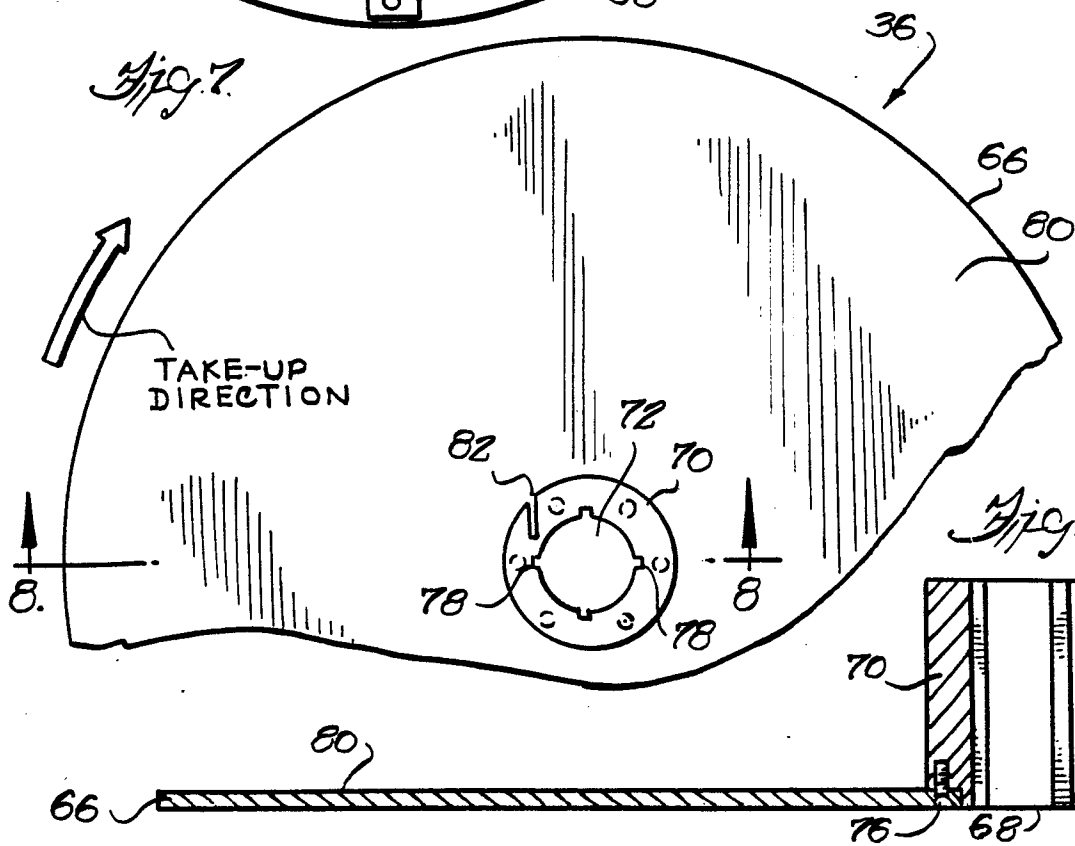
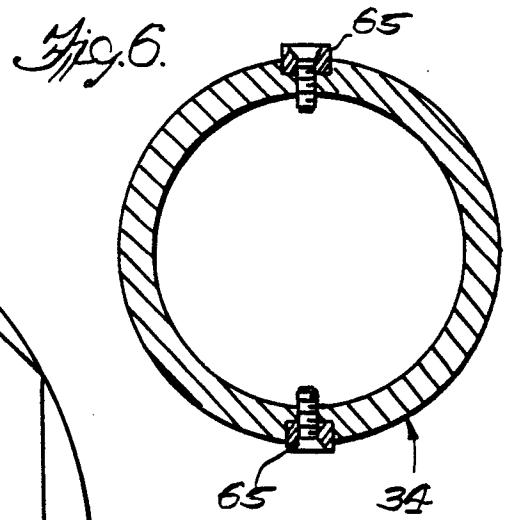
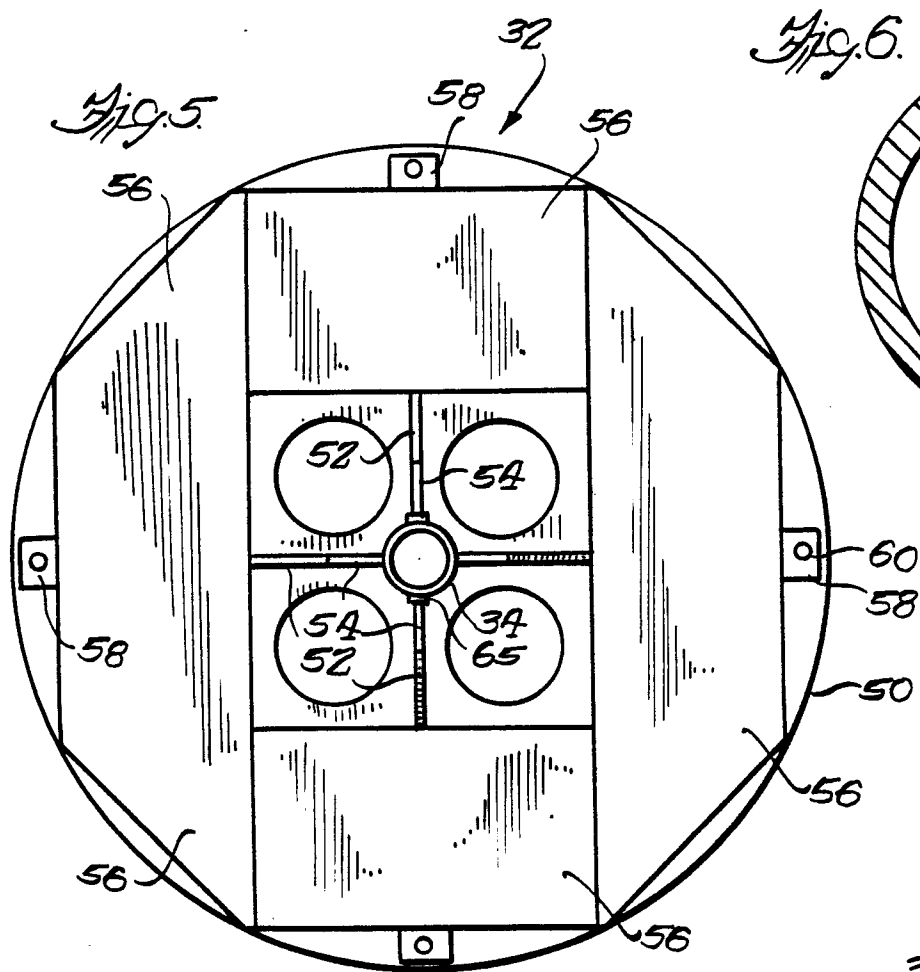
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DOCUMENTS CONSIDERED TO BE RELEVANT			EP 86108739.3
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	<u>FR - A - 2 063 690</u> (PLANCKE) * Totality * --	1,4,5, 6,9	B 65 H 49/18
A	<u>FR - A3 - 2 428 602</u> (GROSREY) * Totality * --	1,2,4, 5,6	
A	<u>US - A - 3 603 526</u> (PAYNE) * Totality * --	1,2,4, 6	
A	<u>US - A - 4 089 486</u> (CARTER) * Totality * --	1,2,4, 5,6	
A	<u>GB - A - 1 368 578</u> (AMP INC.) * Totality * --	10	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	<u>CH - A - 557 778</u> (GEISSER) * Totality * ----		B 65 H 49/00 H 01 R 43/00 H 02 G 1/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 06-11-1986	Examiner SCHATEK
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			