Feb. 16, 1965 R. D. ZIELINSKI 3,170,089

SWITCHING ASSEMBLY

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Fig. 1

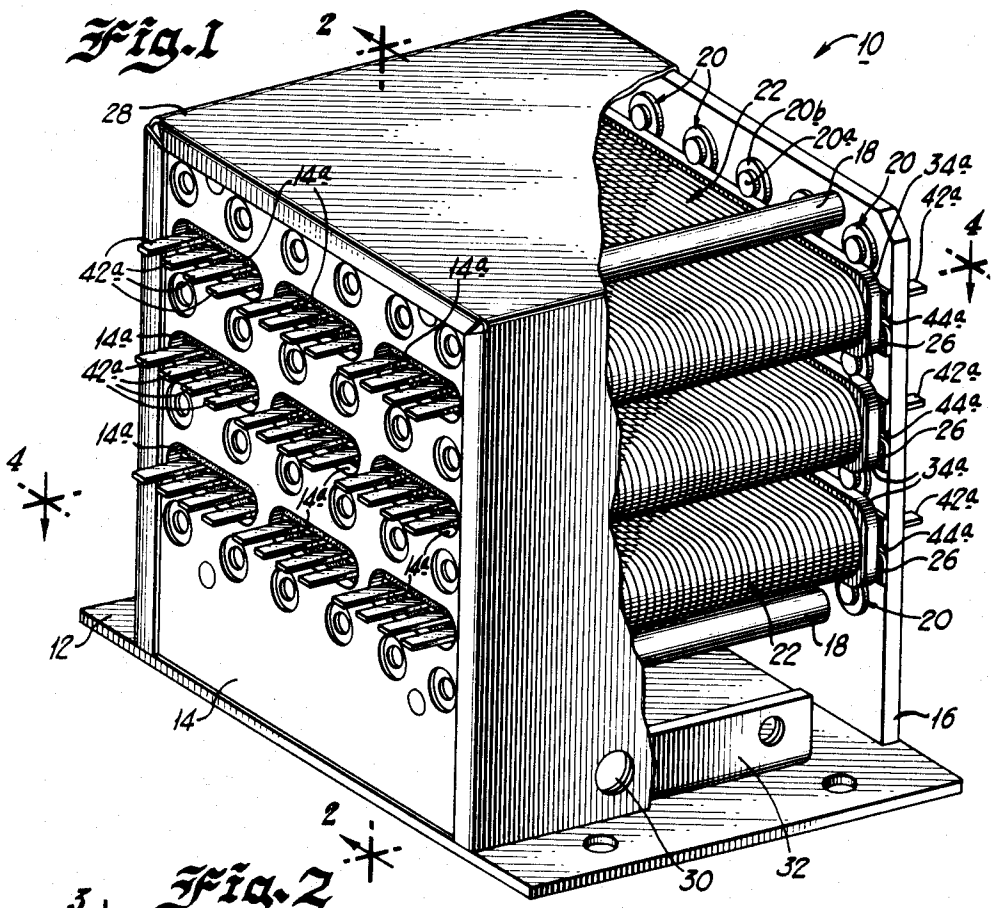
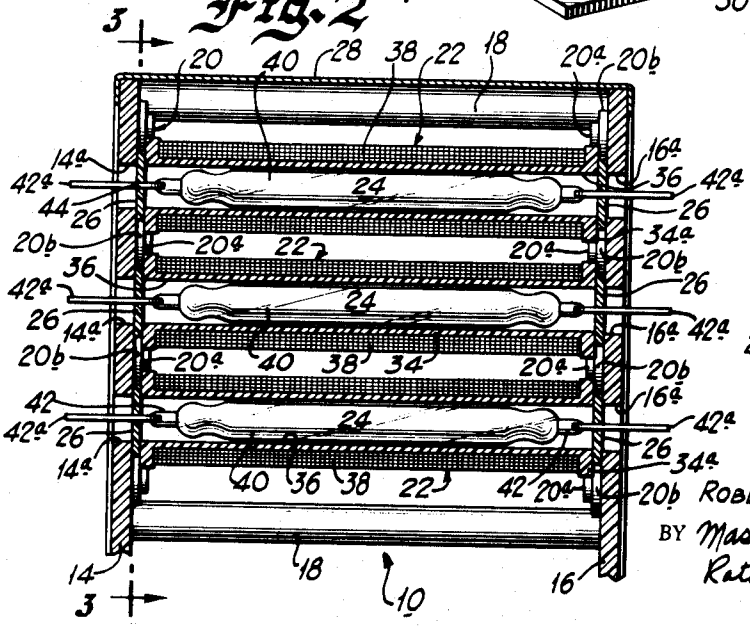


Fig. 2



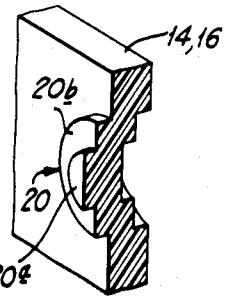


Fig. 7

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Fig. 3

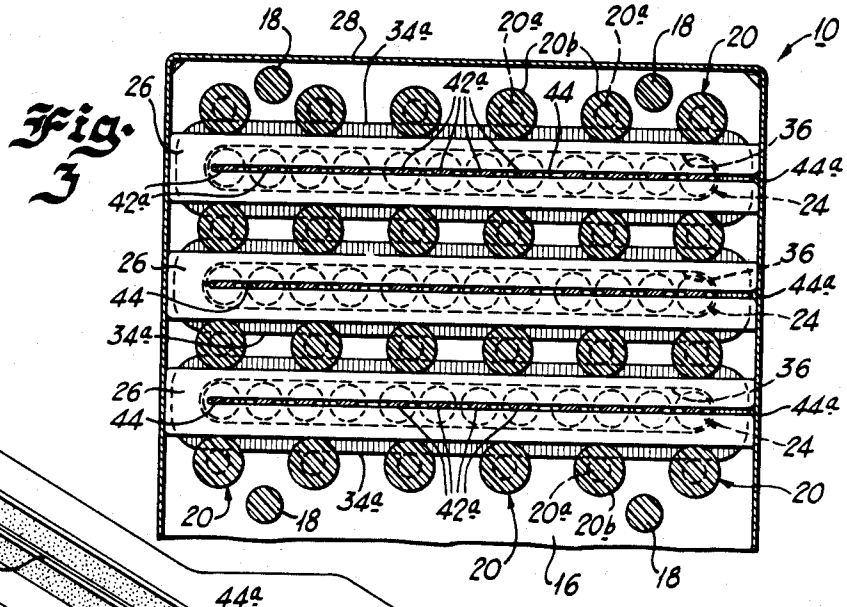
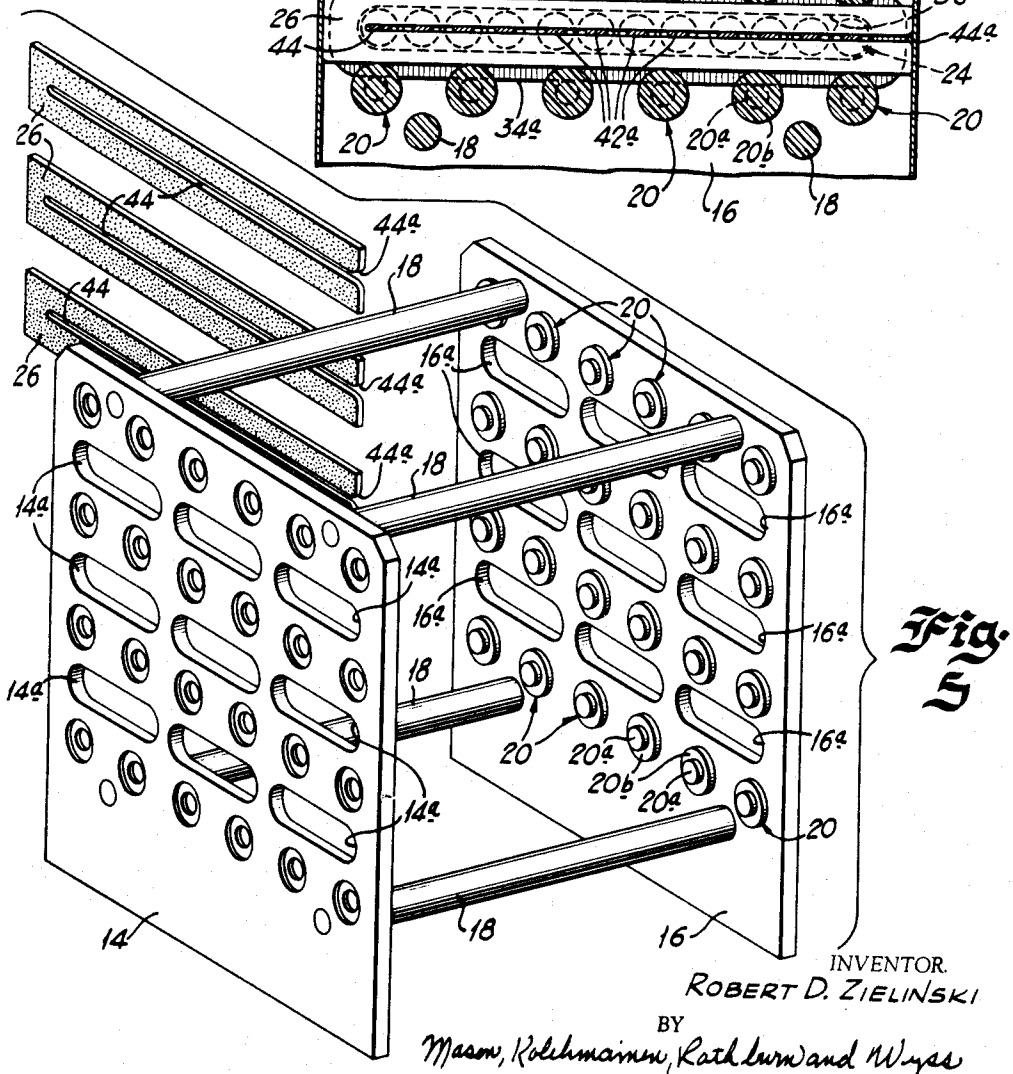


Fig. 5



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SWITCHING ASSEMBLY

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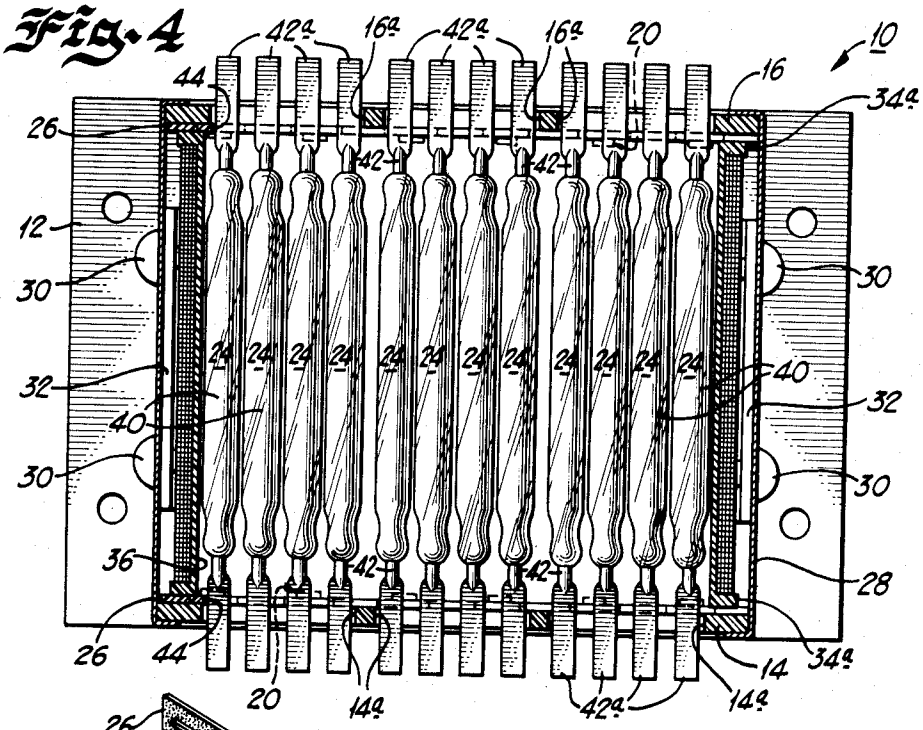
Fig. 4



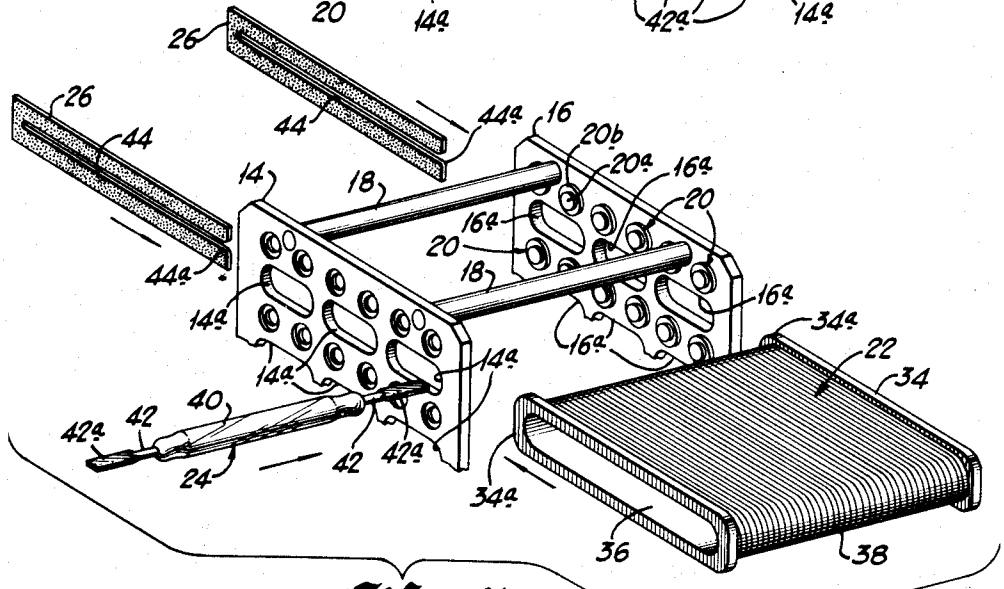


Fig. 5

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3,170,089

SWITCHING ASSEMBLY

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15 Claims. (Cl. 317—101)

This invention relates to a switching assembly and, more particularly, to a switching assembly using a plurality of individual sealed switch units.

Sealed switch units, such as magnetic reed switches or wetted contact switches, are frequently used in switching assemblies in which a relatively large number of individual units or capsules are required to perform the necessary switching or control functions. In the past, the manufacture of these large capacity switching assemblies has been somewhat difficult and time consuming because of the necessity of holding a large number of switch units in correct positions until they can be secured in place, as by completing the electrical connections thereto. Further, it is frequently difficult to replace a defective winding or switch unit in a completed switching assembly containing a large number of the individual sealed switch units because of the relatively permanent nature of the means used to secure the switch units in place or because the construction of the assembly is such that removing the mounting means for the defective switch or winding releases the remaining switches and windings.

Accordingly, one object of the present invention is to provide a new and improved switching assembly using a plurality of individual sealed switch units.

Another object is to provide a switching assembly including new and improved means for mounting a plurality of individual switch capsules in predetermined positions.

Another object is to provide a switching assembly using a large number of individual switches that can be easily and quickly assembled.

Another object is to provide a switching assembly including means for easily replacing individual switch units or the operating windings therefor.

A further object is to provide a switching assembly including new and improved means for detachably mounting individual switch capsules on the assembly.

In accordance with these and many other objects, an embodiment of the invention comprises a switching assembly having a supporting structure formed by a baseplate and a pair of spaced wall elements provided with a plurality of aligned and elongated openings. The inner and opposed or facing surfaces of the wall elements are provided with a plurality of parallel rows of bossed portions disposed opposite each other and adjacent the elongated openings. The bossed portions include portions of two diameters, the smaller of which provide guide means for slidably supporting the windings or bobbins and the larger of which provide second guide means for slidably receiving a plurality of locking or retaining means.

When the switching assembly is to be fabricated, one or more winding means including a coil bobbin and an operating coil having an axially extending opening are inserted between the wall elements and slidably advanced over the first guide means to positions in which the axial openings in the winding means are aligned with the elongated openings formed in the two wall elements. One or more sealed switch units consisting of a dielectric envelope from the opposite ends of which a pair of magnetic terminals extend are then inserted through the elongated openings in the wall elements into the axial openings of the winding means and positioned so that the terminals project through the elongated openings of the

wall elements at opposite sides of the switching assembly.

A pair of slotted retaining or locking elements are inserted between the inner walls of the wall elements and the outer ends of each of the winding means and slidably advanced over the second guide means to their normal positions. The somewhat flattened ends of the magnetic terminals are slidably received in the slots in the locking means so that when the locking means have been fully inserted, all of the sealed switch units are locked against removal from the axial openings in the winding means and are held in predetermined oriented positions relative to each other. An outer housing is then placed over the assembly to prevent displacement of the locking means or the windings.

Many other objects and advantages of the present invention will become apparent from considering the following detailed description in conjunction with the drawings in which:

FIG. 1 is a fragmentary perspective view of a switching assembly embodying the present invention;

FIG. 2 is a sectional view taken along line 2—2 in FIG. 1;

FIG. 3 is a sectional view taken along line 3—3 in FIG. 2;

FIG. 4 is a sectional view taken along line 4—4 in FIG. 1;

FIG. 5 is an exploded view illustrating the supporting structure and locking means used in the switching assembly;

FIG. 6 is an exploded view illustrating the method of assembly, a winding means and a sealed switch unit using the supporting means and locking means illustrated in FIG. 5; and

FIG. 7 is an enlarged perspective view of a portion of a guide structure used on the supporting elements in the switching assembly.

Referring now more specifically to FIG. 1 of the drawings, therein is illustrated a switching assembly, indicated generally as **10**, which embodies the present invention and which includes a baseplate **12** on which two supporting or wall elements **14** and **16** providing a supporting structure for the switching assembly are mounted. The wall elements **14** and **16**, which are secured in parallel spaced positions by a plurality of spacer rods **18**, include both a plurality of aligned elongated openings or apertures **14***a* and **16***a* (FIG. 5) and a plurality of bossed portions **20** providing first and second guide means.

When the switching assembly **10** is to be fabricated, one or more winding means, indicated generally as **22** (FIG. 6), are inserted between the supporting elements **14** and **16** to be slidably mounted on the first guide means and are advanced to positions aligned with the openings **14***a* and **16***a*. A plurality of sealed switch units, indicated generally as **24**, are inserted through the openings **14***a* or **16***a* into the winding means **22**, and two locking, detent, or retaining means **26** are inserted on the second guide means interposed between the opposite ends of each of the winding means **22** and the adjacent surfaces of the walls **14** and **16** to secure the individual sealed switch units **24** in their assembled position on the supporting structure.

An outer housing or dust cover **28** is then placed over the assembled switches and winding means and is secured by a plurality of screws or machine bolts **30** to a pair of flanges **32** on the baseplate **12**. The outer housing **28** prevents the displacement of the slidably mounted winding means **22** and locking means **26** and thus retains the switch units **24** in their assembled positions.

With the improved construction of the switching assembly **10**, one or more of the sealed switch units **24** can be replaced merely by removing the cover **28** and one of the locking or retaining means **26** disposed adjacent the

winding means 22 in which the switch 24 to be replaced is mounted. Similarly, one of the winding means 22 can be replaced merely by removing the outer housing 28 together with the sealed switches 24 and retaining means 26 associated with the winding means 22 to be removed. These components are positively secured in their desired positions when the locking means 26 are replaced.

Referring now more specifically to the supporting structure, the walls 14 and 16 preferably are formed of a dielectric material while the baseplate 12 and the housing or cover 28 can be formed of metal. When the walls or supporting elements 14 and 16 are formed of a dielectric or plastic material, the bossed portions 20 can be formed by a suitable stamping operation with heated dies. In the switching assembly 10, the bossed portions 20 are formed as four spaced lines (FIG. 5) disposed on opposite sides of the three lines of openings 14*a* and 16*a* and comprise two portions 20*a* and 20*b* of different diameters (FIG. 7). The peripheral surfaces of the smaller diameter bossed portions 20*a* provide the first guide means for slidably supporting the winding means 22, and the peripheral surfaces of the larger diameter bossed portions 20*b* provide second guide means for slidably supporting the plurality of retaining or locking means 26.

The winding means 22 (FIG. 6) comprises a coil bobbin 34 having a body portion defining an axially extending opening 36 and two spaced flange portions 34*a* between which an operating coil or winding 38 is disposed. The coil bobbin 34 preferably is formed of a dielectric material and can comprise a unitary or multipart construction. When the switching assembly 10 is to be assembled, each winding means 22 is inserted between the wall elements 14 and 16 between two adjacent rows of bossed portions 20 so that the upper edges of the flanged portions 34*a* engage the lower surfaces of the upper row of bossed portions 20*a* and the lower edges of the flanged portions 34*a* engage the upper surfaces of the bossed portions 20*a* in the next lowest row. Each winding means 22 is then moved between the wall members 14 and 16 by sliding engagement with the guide means formed by the aligned rows of bossed portions 20*a* until the axial opening 36 in the winding means 22 is aligned with the related row of elongated openings 14*a* and 16*a*. Although the switching assembly 10 is shown as including only a single winding means 22 supported between each adjacent pair of rows of the bossed portions 20*a*, the use of smaller bobbins 34 will permit a plurality of separate winding means 22 to be mounted adjacent any row of the openings 14*a* and 16*a*.

The sealed switch units 24 can comprise any of the dry or wetted contact switch units well known in the art but preferably comprise the dry reed switch capsules illustrated in the drawings. These reed switch units include an elongated dielectric housing or capsule 40 from the opposite ends of which a pair of magnetic terminals 42 extend. The inner ends of the magnetic terminals 42 are normally maintained in an overlapped but spaced relation and are moved into engagement to complete a conductive circuit between the two terminals 42 in response to an applied magnetic field of a given strength. An outer end portion 42*a* of each of the terminals is formed with a generally flat configuration.

After the winding means 22 have been properly positioned on the supporting elements 14 and 16 with the axial openings 36 aligned with the openings 14*a* and 16*a*, the sealed switch capsules 24 are inserted through one of the openings 14*a* or 16*a* to be disposed within the axial openings 36. When the switch units 24 are properly mounted within the winding means 22, the flattened portions 42*a* of the terminals 42 extend outwardly through the openings 14*a* and 16*a* at the opposite sides of the switching assembly 10.

The plurality of sealed switch units 24 can now be positively secured in position by the locking means 26. The locking or retaining means 26 comprise an elongated

dielectric element having a slot 44 open at one end and extending substantially throughout the entire length of the element 26. The width of the retaining means 26 is substantially equal to the distance between two aligned and vertically spaced ones of the bossed portions 20*b*. When the sealed switch units 24 are to be locked in position, the slotted end of a locking means 26 is inserted between each end wall of the bobbin 34 and the adjacent wall of the supporting element 14 or 16 positioned between two adjacent rows of the bossed portions 20 with the lower surface of the locking means 26 resting on the upper surfaces of the lower bossed portions 20*b* and the upper edge of the locking means 26 engaging the lower surfaces of the upper bossed portions 20*b*. The locking means 26 are then moved inwardly or to the right, as illustrated in FIG. 6, so that the flat portions 42*a* of the terminals 42 at both ends of the dielectric envelopes 40 are slidably received within the slots 44. This latches the plurality of sealed switch units 24 in the positions illustrated in FIGS. 1–4 of the drawings in which the gaps between the inner ends of the magnetic terminals 42 are all oriented in a similar manner relative to each other. The outer ends of the slots 44 in the retaining means 26 are provided with rounded or outwardly flared portions 44*a* (FIGS. 3, 5 and 6) to facilitate turning any terminals 42*a* that are displaced slightly from a position parallel to the plane of the slot 44.

The switching assembly 10 can also be fabricated by inserting one of the locking or retaining means 26 at one end of each of the winding means 22 prior to inserting the sealed switches 24 into the axial openings 36. As an example, the latching means 26 shown to the right in FIG. 6 is inserted between the right end of the bobbin 34 and the inner surface of the supporting element 16 prior to the insertion of the sealed switch units 24. Each switch unit 24 must be turned to a properly aligned or oriented position during its insertion through the opening 14*a* into the axial opening 36 in order to permit the flat portion 42*a* on the right-hand terminal (FIG. 6) to pass through the slot 44 in the right-hand locking or retaining means 26. When assembled in this manner, all of the sealed switch units 24 are aligned in proper positions before the remaining or left-hand retaining means 26 is inserted.

The fabrication of the switching assembly 10 is completed by placing the dust cover or housing 28 over the supporting elements or walls 14 and 16 and by securing this cover to the flanges 32 with the machine bolts 30. The upper and side edges of the cover 28 are folded over to embrace the adjacent portions of the edges of the wall elements 14 and 16. The switching assembly 10 can then be installed by securing the baseplate 12 to a suitable supporting means and by extending electrical connections to the flat portions 42*a* of the terminals 42 which extend outwardly beyond the outer surfaces of the supporting elements 14 and 16.

Whenever it is necessary to replace one of the sealed switch units 24, the electrical connections to the terminals 42 thereof are opened and the housing 28 is removed from the switching assembly 10. One of the retaining means 26 associated with the winding means 22 in which the switch unit 24 to be replaced is disposed is then withdrawn a sufficient distance so that the flat portion 42*a* on the terminal 42 at one end of this switch unit 24 is out of the slot 44 in the displaced locking means 26. This permits the withdrawal of this switch unit through one of the openings 14*a* or 16*a* and the insertion of a replacement capsule. Because one of the locking means 26 remains in position, the remaining switch capsules 24 are at least frictionally held in position, and those of the switch capsules that are disposed to the side of the replaced switch unit 24 covered by the partially displaced locking means 26 remain positively secured in position.

One of the winding means 22 can easily be replaced by withdrawing the locking means 26 at both ends there-

of and removing all of the sealed switch units **24** disposed within its axial opening **36**. The winding means is removed from the supporting frame by sliding it along the engaged surfaces of the bossed portions **20***a*. The replacement winding means **22** can then be inserted followed by the insertion of the necessary number of sealed switch units **24** and the pair of locking means **26**.

Accordingly, the switching assembly **10** embodied in the present invention provides a new and improved structure for supporting the plurality of individual sealed units or capsules **24** in their desired positions on the supporting structure and for also permitting these switch units to be easily replaced. Similarly, the construction of the switching assembly **10** is such that the winding means **22** are easily assembled or removed and permits the same basic supporting structure to be used with different combinations of winding means **22** for operating different numbers and combinations of sealed switch units **24**.

Although the present invention has been described with reference to a single illustrative embodiment thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this invention.

What is claimed and desired to be secured by Letters Patent of the United States is:

1. A switching assembly comprising a supporting structure providing a plurality of first sets of guide means and a plurality of second sets of guide means, a plurality of winding means each slidably mounted on one of said first sets of guide means, a plurality of sealed switch units disposed within said winding means, and a plurality of retaining means each slidably mounted on one of said second sets of guide means to hold the sealed switch units within the winding means.

2. A switching assembly comprising a plurality of spaced winding means each having an axially extending opening, a plurality of sealed switch units with terminals, said sealed switch units being slidably mounted in said axially extending openings with the terminals projecting out of the winding means, said sealed switch units being generally aligned in a row, and detent means mounted adjacent at least one end of the winding means for sliding movement in a direction transverse to the axes of the openings in the winding means and along the row of sealed switches, said detent means being movable from a closed position in which it engages the row of sealed switch units to secure them in position within the winding means to an open position in which the detent means is spaced from at least some of the sealed switch units in the row to permit their removal from the winding means.

3. A switching assembly comprising a pair of spaced supporting elements, at least one of said elements having an aperture, winding means mounted between said supporting elements in a position in which an axial opening in said winding means is aligned with the aperture, a plurality of sealed switch units having terminals extending from at least one end, said sealed switch units being slidably mounted in said axial opening with the terminals extending through the aperture in the supporting element, and an integrally formed retaining means mounted on said one supporting element and receiving the terminals on the plurality of sealed switch units to detachably secure the sealed switch units in a proper position within the axial opening in said winding, said retaining means being movably mounted on said supporting element to permit its displacement and the removal of the sealed switch units from the switching assembly.

4. A switching assembly comprising a supporting structure having an aperture, winding means having an axial opening, means on said structure mounting said winding means for sliding movement relative to said structure in a direction transverse to the axis of said opening to permit the axial opening in the winding means to be aligned with said aperture, a plurality of sealed switch units slidable into the axial opening in said winding means through said aperture, and locking means carried on said structure and movable from a normal position engaging said sealed switch units to hold them in position to a displaced position in which the sealed switch units can be removed from the winding means through said aperture.

5. The switching assembly set forth in claim 4 including means on said supporting structure mounting said locking means for sliding movement in a direction transverse to the axis of the opening in the winding means.

6. A switching assembly comprising a supporting structure having an elongated opening, spaced first and second guide means on said structure adjacent the elongated opening, winding means slidably mounted on the first guide means and including an axial opening aligned with the elongated opening, a plurality of sealed switch units mounted in said axial opening through said elongated opening, and retaining means slidably mounted on the second guide means to retain the sealed switch units in said axial opening.

7. The switching assembly set forth in claim 6 in which said sealed switch units include terminals and in which said retaining means include a slot slidably receiving said terminals.

8. A switching assembly comprising a supporting structure having two sets of spaced guide means adjacent an aperture, winding means slidably mounted on one set of said guide means and disposed in a position in which an axial opening in the winding means is aligned with the aperture, a plurality of sealed switch units slidably mounted in the axial opening by insertion through the aperture, and retaining means slidably mounted on the second pair of guide means and securing the sealed switch units within the opening in the winding means.

9. The switching assembly set forth in claim 8 in which said sealed switch units each includes a terminal projecting through the aperture in the supporting structure and in which said retaining means includes means slidably receiving the terminals.

10. A switching assembly comprising a pair of spaced supporting elements having aligned and elongated openings therein, winding means having an axial opening and mounted between the pair of supporting elements with the axial opening aligned with the elongated openings, a plurality of sealed switch units each having an elongated housing from the opposite ends of which a pair of terminals project, said sealed switch units being inserted into the axial opening through one of the elongated openings and being so positioned that the terminals project outwardly through the elongated openings in the spaced supporting elements, guide means on each of the pair of supporting elements, each of the guide means being disposed adjacent one of the elongated openings, and a pair of locking means each slidably mounted on one of the guide means at opposite ends of the winding means and slidably receiving the terminals on the sealed switch units to hold the sealed switch units in position.

11. The switching assembly set forth in claim 10 including means on said supporting elements slidably supporting said winding means.

12. The switching assembly set forth in claim 10 including a housing at least partially enclosing said assembly and including portions preventing displacement of said pair of locking means.

13. A switching assembly comprising a pair of spaced supporting elements each having a plurality of openings aligned with openings in the other of the supporting elements, a plurality of winding means with axial openings, a plurality of guide means on said supporting elements to permit the plurality of winding means to be slidably mounted on said guide means adjacent a given group of the openings in the supporting elements with the axial openings in the winding means aligned with the openings

in the supporting elements, a plurality of sealed switch units inserted through the openings in the supporting elements to be disposed in the axial openings of the winding means, and movable locking means carried on at least one of the supporting elements and movable between a first position in which the sealed switch units can be inserted into the said openings of the windings and a second position in which the previously inserted switch units are held against removal.

14. A switching assembly comprising a pair of spaced supporting elements each having a plurality of openings aligned with openings in the other of the supporting elements, a plurality of winding means with axial openings, a plurality of first guide means on said supporting elements to permit the plurality of winding means to be slidably mounted on said first guide means adjacent a given group of the openings in the supporting elements with the axial openings in the winding means aligned with the openings in the supporting elements, a plurality of sealed switch units inserted through the openings in the supporting elements to be disposed in the axial openings of the winding means, each of said sealed switch units having a

terminal projecting from at least one end, second guide means on said supporting elements adjacent said openings, and a plurality of retaining means selectively slidable on the ones of the second guide means adjacent the openings through which sealed switch units have been inserted for cooperating with the terminals to hold the switch units in position.

15. The switching assembly set forth in claim 14 in which the first and second guide means include concentric bosses of different diameters formed in aligned positions on the supporting elements.

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