June 28, 1966 J. E. BERNARD, JR 3,258,545

REEL ASSEMBLY

Original Filed June 3, 1959 2 Sheets-Sheet 1

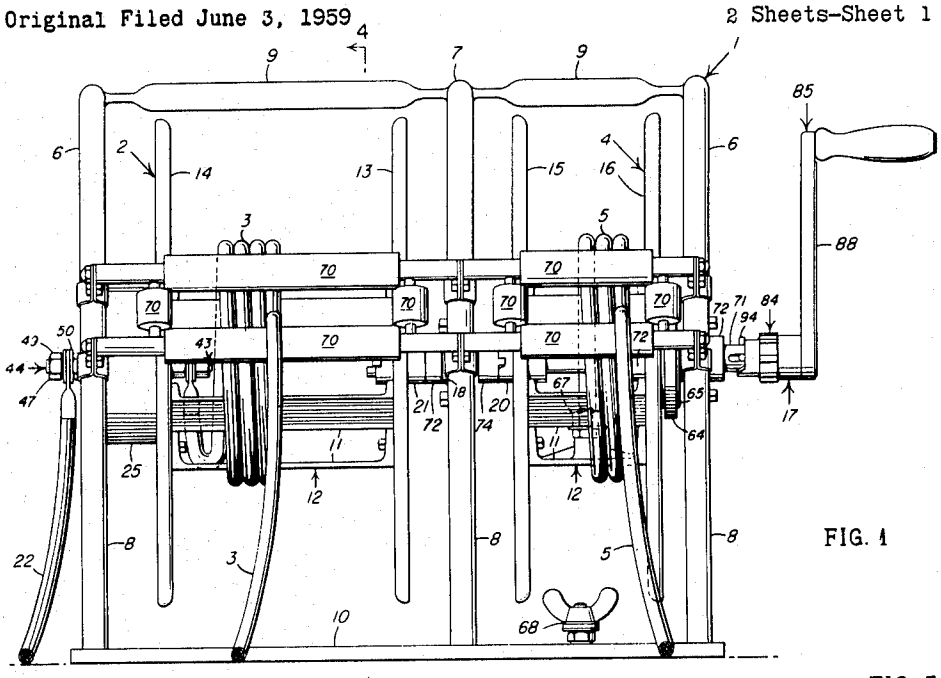


FIG. 1

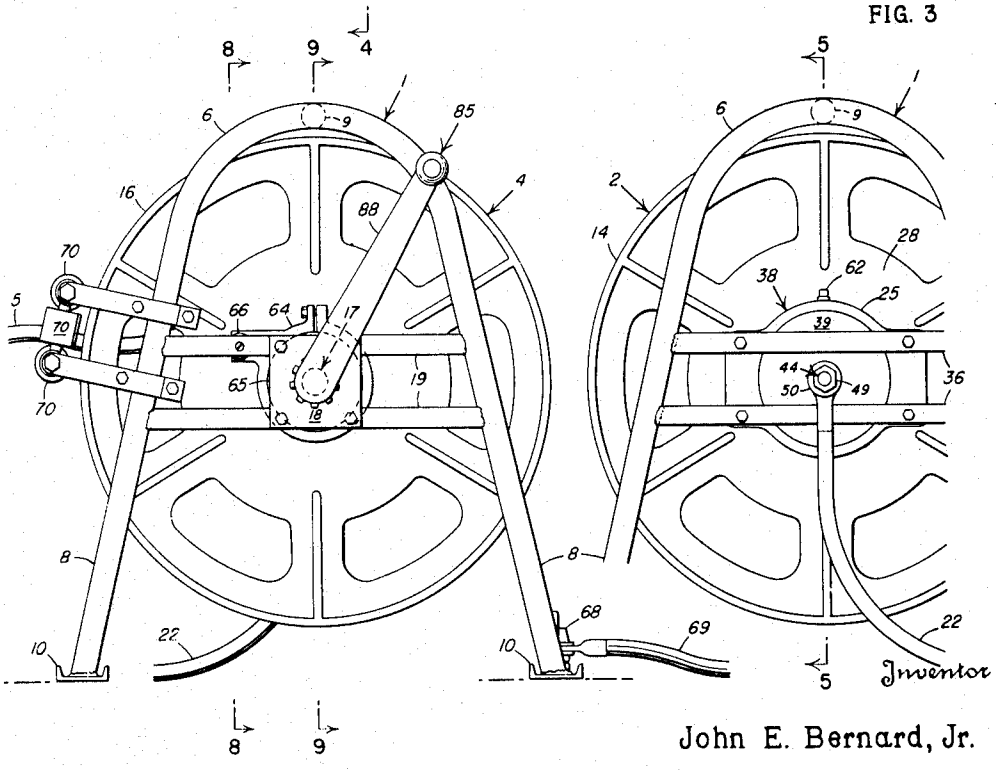


FIG. 3

FIG. 2

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REEL ASSEMBLY

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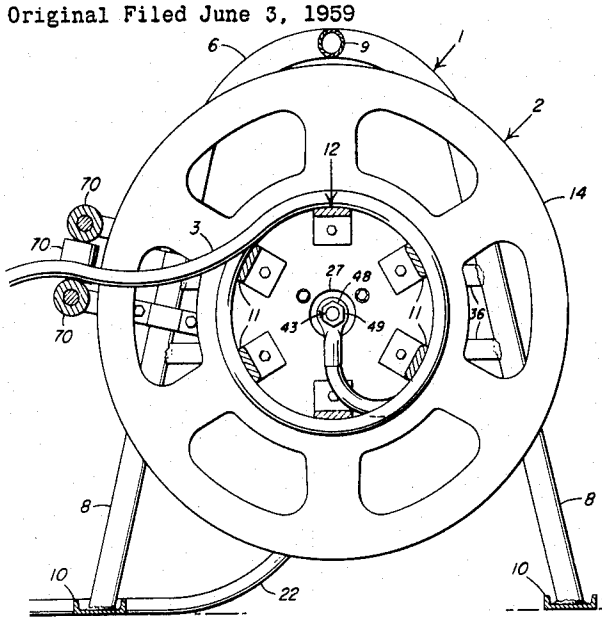
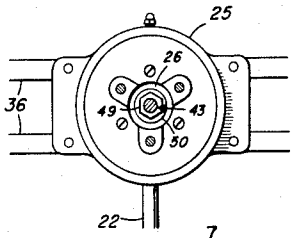


FIG. 4

FIG. 7



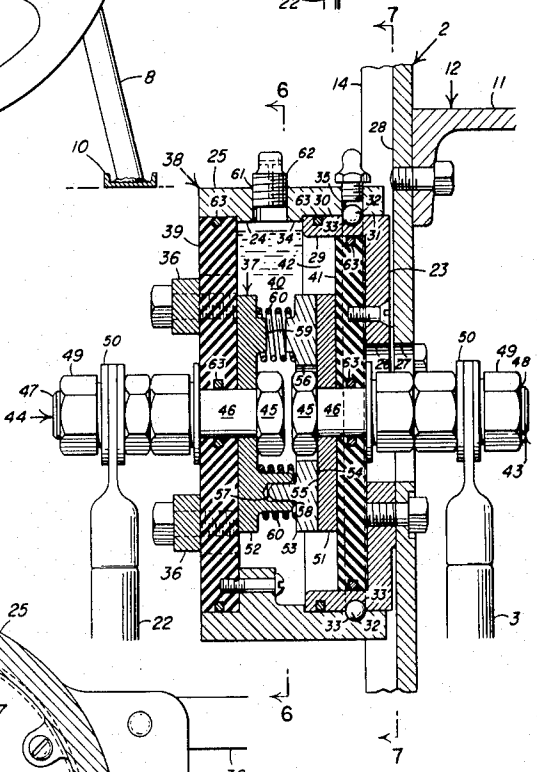
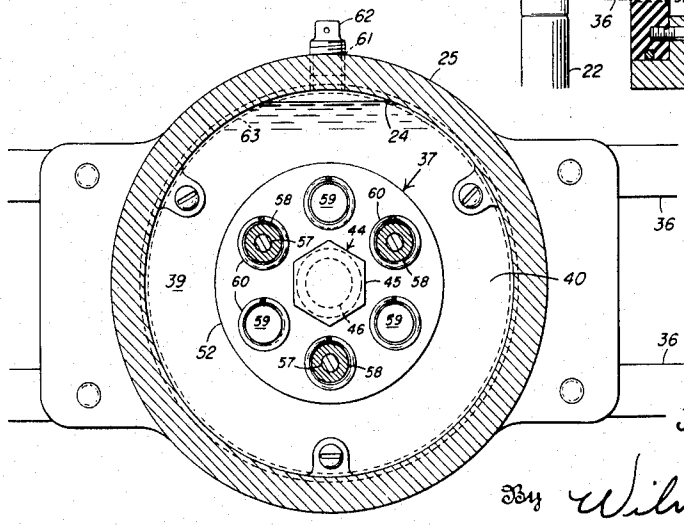


FIG. 5

FIG. 6



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REEL ASSEMBLY

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Original application June 3, 1959, Ser. No. 817,786, now Patent No. 3,106,366, dated Oct. 8, 1963. Divided and this application Jan. 8, 1963, Ser. No. 250,037

8 Claims. (Cl. 191—12.2)

This application is a division of my copending application Serial No. 817,786, filed June 3, 1959, now Patent No. 3,106,366, issued October 8, 1963.

This invention relates to reel assemblies and has for an object the provision of an improved reel assembly for making contact with one or more conductors.

Another object of the invention is to provide an improved reel assembly for making an explosion-proof contact with a "hot" electrical lead.

A further object of the invention is to provide an improved current collector for electrically connecting relatively rotating terminals which is explosion-proof and will continue to function effectively despite a failure in its main contact means.

Other objects and advantages of the invention will appear hereafter in the detailed description, be particularly pointed out in the appended claims and be illustrated in the accompanying drawings, in which:

FIGURE 1 is a front elevational view of a preferred embodiment of the reel assembly of the present invention;

FIGURE 2 is an end elevational view of the drawing and of the assembly;

FIGURE 3 is a fragmentary end elevational view of the opposite end of the assembly;

FIGURE 4 is a vertical sectional view taken along the lines 4—4 of FIGURE 1;

FIGURE 5 is a fragmentary vertical sectional view on an enlarged scale taken along the lines 5—5 of FIGURE 3;

FIGURE 6 is a vertical sectional view taken along the lines 6—6 of FIGURE 5;

FIGURE 7 is a vertical sectional view on a reduced scale taken along the lines 7—7 of FIGURE 5;

Referring now in detail to the drawings in which like reference characters designate like parts, the improved reel assembly of the present invention in the exemplary form illustrated is designed for use in reeling a plurality of insulated electrical cables, such as the leads between a welding machine and a welding head, and to transfer current to either cable during reeling in such manner as to prevent arcing and so suit the assembly for installations where proof against arc-induced explosions is essential.

The improved reel assembly is comprised of a frame or stand 1 rotatably mounting one or more reels, the frame being suitably adapted for movement or for fixed installation depending on the requirements of the particular use for which the assembly is designed. For reeling electrical cable, the reel assembly will generally have a plurality of reels, one for each of the leads between an energy source and the device to be operated. Also, if the installation calls for direct current and grounding at the work is feasible, a single reel for the one lead then required will suffice. In either case, it is intended that a lead or cable remain on its reel and make contact through the assembly with a lead from the energy source or ground, as appropriate. Consequently, it is desirable that each reel or at least its core be made of aluminum or like non-magnetizable material, to prevent induction of magnetism in the core by current flowing through any of the coils of the lead wrapped therearound.

The reel assembly of the illustrated embodiment is particularly designed for use in reeling electrical cable transmitting current between a welding machine (not shown) and a welding head (not shown) and serves both to store the cable and to pay it out and take it up as needed for the welding head to reach the work to be welded. Since the current used in welding is direct, with one lead positive or negative, depending on the welding conditions, it is possible for the reel assembly to have but a single reel. However, the reel assembly has been illustrated with two reels, a first 2 for reeling by a positive or negative, hereinafter termed "hot," lead or cable 3, and a second 4 for reeling a ground lead or cable 5, in case it is inconvenient to ground the welding head at the work. The reels 2 and 4 are mounted concentrically or coaxially and in axial or longitudinally spaced relation on the frame 1. For such mounting, the frame 1 conveniently has a pair of end uprights 6 and an intermediate upright 7, in longitudinal alignment with each other and each suitably tubular and bent into a somewhat inverted U-shape, with its legs 8 downwardly divergent. Connected at the top by longitudinal braces 9, the uprights 6 and 7 are connected at the bottom by a pair of transversely spaced channel irons or other suitable feet 10, each fixed to the legs 8 of the uprights at one side of the frame 1, the feet, if not used as a base for fixing the frame to a foundation or mounting it on suitable wheels for general mobility, conveniently serving as skids for limited mobility.

Each of the illustrated reels 2 and 4 is formed of a pair of inner and outer axially or longitudinally spaced end wheels, discs or flanges connected by circumferentially spaced slats 11 together forming its non-magnetizable core 12, the inner and outer wheels of the first reel 2 being designated as 13 and 14, respectively, and of the second reel 4 as 15 and 16, respectively.

Each of the reels 2 and 4 is contained longitudinally between the intermediate upright 7 and one of the end uprights 6 and the second or ground reel 4 is rotatably mounted entirely on a shaft or axle 17. In turn, the shaft 17 extends from one end of the frame 1 through and is journalled or rotatably mounted in a pair of axially or longitudinally spaced bearings or bushings 18, one carried by the end upright 6 at that end and the other by the intermediate upright 7, and each conveniently supported on and bolted or otherwise secured or fixed to transverse or cross braces 19 connecting and fixed to or rigid with the legs 8 of its upright. Extending through axially bored hubs 20 in the end wheels 15 and 16 of the second reel 4 with a fit such that the reel is free to rotate relative to it, the shaft 17 also extends into the adjoining end of the first reel 2 and correspondingly fits an axially bored hub 21 of or on the inner wheel 13 of that reel, so as rotatably to mount that end of that reel.

Were the reel assembly designed simply for selectively driving the pair of reels 2 and 4, the shaft 17 could be extended the length of the frame 1 and rotatably mount both ends of both reels. However, an important feature of this invention is an explosion-proof connection through the outer end wheel 14 of the first reel 2 between the hot lead 3 and a corresponding lead 22 from the welding machine to the frame 1 and such a connection requires a different rotatable mounting of that wheel on the adjoining end upright 6. Accordingly, the illustrated shaft 17 terminates slightly beyond the hub 21 of the inner wheel 13 of the first reel 2 and its function for the outer end wheel 14 is performed by a hollow stub axle or trunnion 23 fixed or secured to or rigid with the outer wheel and projecting or extending therebeyond into and rotatably seated or journalled in a cylindrical bore 24 in a housing or casing 25 carried by the adjoining end upright.

In its preferred form, the hollow stub axle **23** is an outwardly cupped end plate or member having a central aperture **26** aligning with a corresponding central or axial aperture **27** in the outer wheel **14** and secured as by bolting to the latter's outer end face **28**. The end plate is given its cup shape by an integral axially outstanding annular or cylindrical, marginal or peripheral flange or skirt **29**, concentric with the hub **21** of the inner wheel **13** and having its rim **30** rotatably seatin in a shouldered inner end portion **31** of the bore **24** in the housing **25**. For facilitating relative rotation of the stub axle **23** and housing **25**, there preferably are provided antifriction means in the form of a plurality of balls **32** interposed between and riding in confronting races or grooves **33** formed in the side wall **34** of the bore **24** and the rim **30** of the flange **29**, the balls, which readily may be inserted and lubricated through a normally plugged radial port **35** in the housing, also serving to lock the first reel **2** and the housing against relative axial movement. Supporting the outer end of the first reel **2**, the housing **25** may be carried or supported on the frame **1** in the same manner as the bushings **18** by bolting or otherwise fixing or securing it to transverse or cross braces **36** extending between and rigidly connecting the legs **8** of its end upright **6**.

The housing **25** not only rotatably mounts the outer end wheel **14** of the first reel **2**, but also serves to shield, house, enclose or contain the current collector **37** of the aforementioned explosion-proof connection or connecting means, now designated as **38**, between the hot lead **3** on the first reel **2** and the corresponding lead **22** from the welding machine. To this end, the cylindrical bore **24**, which extends axially through the housing **25** and is concentric or coaxial with the shaft **17**, is closed at its outer end by an insulating block or disc **39**, the latter conveniently fitting in a shouldered recess in the outer end portion of the bore and being screwed or otherwise suitably secured to the housing. The opposite or inner end of the central chamber or cavity **40** in the housing **25** is closed by an inner insulating block or disc **41** which seats in the outwardly facing socket **42** in the end plate **23** bounded by the latter's peripheral flange **29** and is screwed or otherwise secured to the end plate so as to rotate therewith.

Each of the insulating blocks **39** and **41** carries or mounts and insulates from the frame **1** and first reel **2** one of a pair of outer and inner bolts **43** and **44**, respectively, the heads **45** of which are contained in axially spaced relation in the chamber **40** and the stems **46** of which project oppositely therefrom through their respective insulating blocks. The outer and inner bolts **43** and **44** preferably are substantially concentric with the first reel **2** and, in the threaded end portions of their stems **46** projecting beyond their insulating blocks, provide relatively rotatable outer and inner threaded blocks, provide relatively rotatable outer and inner threaded terminal posts **47** and **48** to which, through suitable nuts **49** and washers **50**, the contiguous ends or terminals of the hot lead **3** and the outside lead **22** from the welding machine are connected. Projecting or extending through the central apertures **26** and **27** in the end plate **23** and outer wheel **14**, the inner terminal post **48** and its associated nuts and washers are insulated therefrom by the air gap provided by the intervening radial spacing.

Transmission of current between the terminal bolts **43** and **44** and therethrough between the hot and outside leads **3** and **22** is the function of the contact elements of the current collector **37**. Housed or contained in the chamber **40** in the housing **25**, the contact elements include a preferably flat and circular inner contact disc or plate **51** of conducting material encircling the stem **46** and clamped by the head **45** of the inner terminal bolt **43** to the inner insulating block **41**, so as to rotate therewith on rotation of the first reel **2**. A second or outer, preferably also circular, disc or plate **52** of conducting material, spaced axially from the first and encircling the stem **46** of the outer terminal bolt **44** is clamped by the latter against the outer insulating block **39**. Between these two discs, the outer **52** stationary and the inner **51** rotatable, is interposed a third or intermediate, preferably circular disc or plate **53** of conducting material having a flat inner face **54** adapted to slide on and have surface contact with the confronting outer face **55** of the inner contact disc **51** and centrally apertured as at **56** loosely to receive and be rotatable relative to the head **45** of the inner terminal bolt **43**.

Electrical contact or connection between the intermediate and outer contact discs **53** and **52** is made mainly by a plurality of circumferentially spaced prongs or studs **57** projecting axially from one of these members, here the intermediate disc, toward the other member and each seating in or interfitting with one of a plurality of correspondingly arranged and projecting socketed protuberances **58** in the other member. Three in number in the illustrated embodiment and equally spaced, these interfitting studs **57** and protuberances **58** serve not only as the main contacts between the outer and intermediate discs **52** and **53**, but to center and hold the latter disc against rotation. At the same time, they serve, with intervening, circumferentially spaced pairs of confronting bosses **59** on the two members, to locate or position a plurality of coil springs **60**, each encircling one of the main contacts or pairs of bosses and acting axially between the outer and intermediate discs to urge the latter into contact with the inner disc **51**. Not only are these springs **60** the means by which contact between the intermediate and inner discs **53** and **51** is maintained during their relative rotation, but by making them of Phosphor-bronze or like resilient conducting material of sufficient gauge, the springs are enabled to serve as auxiliary contacts between the outer and intermediate discs in case of failure in a main contact due to breakage or wear.

With contact between the outer and inner terminal bolts **44** and **43** established at all times by the several contact discs **51**, **52** and **53**, any possible arcing in the connecting is prevented by filling the central chamber with transformer oil or like non-conducting fluid so as to immerse the contact discs in that medium, the chamber being filled through a suitable filler hole **61** extending radially through the top of the housing **25** and normally closed by a breather plug or like suitable means **62** to permit expansion and contraction of the oil. To enable the oil to be held without leakage in the reservoir **62**, the joints between the various elements about the chamber are sealed by O-rings or like suitable gaskets **63**.

While, by contrast with the hot lead **3** on the first reel **2**, the ground lead **5** on the second reel **4** is grounded through the latter and the frame **1** and presents no particular arcing problem, it nonetheless is desirable to ensure that the lead will be grounded from the reel directly to the frame, rather than through the shaft **1**. For this purpose, there is provided a collecting ring **64**, split for adjustability and slidably encircling a central or axial annular flange **65** on the outer wheel **16** of the second reel **4**, the ring having an integral lug **66** of substantial area through which it is bolted or otherwise directly secured to one of the cross braces **19** of the adjoining end upright **6**. With the inner terminal of the ground lead **5** connected to a binding post **67** conveniently provided for that purpose on one of the slats **11** of the second reel, current will thus flow from the ground lead through the reel and the frame **1** to the feet **10** and therethrough to the ground. In case the frame itself is not directly grounded due to the nature of its mounting or the particular surface on which it rests, it usually will be desirable to provide a binding post **68** on one of the feet **10** for a cable connection, indicated at **69**, between the frame and a suitable ground.

With each of the hot and ground cables **3** and **5** running through one of a pair of sets of guide rollers **70** suitably mounted for that purpose on one side of the frame **1**, the reels **2** and **4** preferably are made selectively drivable so that the cables may be reeled out or in, either together or independently, in the manner described in my copending application Ser. No. 817,786, filed June 3, 1959.

From the above-detailed description, it will be apparent that there has been provided an improved reel assembly capable of providing an explosion-proof connection between a cable wound on a reel and a source of power. It should be understood that the described and disclosed embodiment is merely exemplary of the invention and that all modifications are intended to be included which do not depart from either the spirit of the invention or the scope of the appended claims.

Having described my invention, I claim:

1. A reel assembly comprising a frame, a reel rotatably mounted at one end on said frame, a housing mounted on said frame and rotatably mounting an opposite end of said reel, and an oil-immersed current collector enclosed in said housing for electrically connecting a cable on said reel with a power source.

2. A reel assembly comprising a frame, a reel rotatably mounted at one end on said frame, and a current collector for electrically connecting a cable on said reel to a power source, said collector including a housing mounted on said frame and rotatably mounting an opposite end of said reel, a contact disc in said housing and connected for rotation with said reel, and disc means in and restrained against rotation relative to said housing and yieldably urged into facial engagement with said contact disc.

3. A reel assembly comprising a frame, a reel rotatably mounted at one end on said frame, and a current collector for electrically connecting a cable on said reel to a power source, said collector including a housing mounted on said frame and mounting an opposite end of said reel, an oil-fillable sealed chamber in said housing, a contact disc member in said chamber and connected for rotation with said reel, a stationary contact disc in said chamber, and disc means in said chamber intermediate said discs for transmitting current therebetween, said disc means being restrained against rotation relative to one and yieldably urged into facial engagement with the other of said discs.

4. A reel assembly comprising a frame, a reel, an axle on one end of said reel rotatably mounted on said frame, and a current collector for electrically connecting a cable on said reel to a power source, said collector including a housing mounted on said frame and having a bore rotatably receiving an axle on the opposite end of said reel, antifriction means interposed radially between and interlocking said housing and axle against relative axial movement, a contact disc in said bore and connected for rotation with said reel, and disc means in and restrained against rotation relative to said housing and yieldably urged into facial engagement with said contact disc.

5. A reel assembly comprising a frame, a reel rotatably mounted at one end on said frame and having a hollow stub axle on an opposite end thereof, and a current collector for electrically connecting a cable on said reel to a power source, said collector including a housing mounted on said frame, an axial bore extending through said housing and rotatably seating said axle in an inner end thereof, a pair of axially spaced insulating blocks each secured to one of said housing and axle, said blocks and axle together bounding and sealing ends of an oil-fillable chamber in said housing, a pair of terminal bolts each mounted on one of and extending oppositely through said insulating blocks, a contact disc in said chamber and clamped by one of said bolts to one of said blocks, a contact disc axially spaced from said first disc and attached by the other bolt to the other block, and a contact disc intermediate said spaced discs, said intermediate disc being yieldably urged into sliding engagement with one of said spaced discs and restrained against rotative movement relative to and in electrical contact with the other spaced disc.

6. A reel assembly comprising a frame, a reel rotatably mounted at one end on said frame and having a hollow stub axle on an opposite end thereof, and a current collector for electrically connecting a cable on said reel to a power source, said collector including a housing mounted on said frame, an axial bore extending through said housing and rotatably seating said axle in an inner end thereof, a pair of axially spaced insulating blocks each secured to one of said housing and axle, said blocks and axle together bounding and sealing ends of an oil-fillable chamber in said housing, a pair of terminal bolts each mounted on one of and extending oppositely through said insulating blocks, a contact disc in said chamber and clamped by one of said bolts to one of said blocks, a contact disc axially spaced from said first disc and attached by the other bolt to the other block, a contact disc intermediate and slidably contactable with one of said spaced discs, interfitting means on said other spaced and intermediate discs for electrically connecting and restraining said discs against relative rotation, and spring means acting axially between said other spaced and intermediate discs for urging said intermediate disc into said sliding contact with said one spaced disc.

7. A reel assembly comprising a frame, a reel rotatably mounted at one end on said frame and having a hollow stub axle on an opposite end thereof, and a current collector for electrically connecting a cable on said reel to a power source, said collector including a housing mounted on said frame, an axial bore extending through said housing and rotatably seating said axle in an inner end thereof, a pair of axially spaced insulating blocks each secured to one of said housing and axle, said blocks and axle together bounding and sealing ends of an oil-fillable chamber in said housing, a pair of terminal bolts each mounted on one of and extending oppositely through said insulating blocks, a contact disc in said chamber and clamped by one of said bolts to one of said blocks, a contact disc axially spaced from said first disc and attached by the other bolt to the other block, a contact disc intermediate and slidably contactable with one of said spaced discs, interfitting means on said other spaced and intermediate discs for electrically connecting and restraining said discs against relative rotation, and current conducting spring means acting axially between said other spaced and intermediate discs for urging said intermediate disc into said sliding contact with said one spaced disc.

8. A reel assembly comprising a frame, a reel rotatably mounted at one end on said frame and having a hollow stub axle on an opposite end thereof, and a current collector for electrically connecting a cable on said reel to a power source, said collector including a housing mounted on said frame, an axial bore extending through said housing and rotatably seating said axle in an inner end thereof, a pair of axially spaced insulating blocks each secured to one of said housing and axle, said blocks and axle together bounding and sealing ends of an oil-fillable chamber in said housing, a pair of terminal bolts each mounted on one of and extending oppositely through said insulating blocks, a contact disc in said chamber and clamped by one of said bolts to one of said blocks, a contact disc axially spaced from said first disc and attached by the other bolt to the other block, a contact disc intermediate and slidably contactable with one of said spaced discs, interfitting means on said other spaced and intermediate discs for electrically connecting and restraining said discs against relative rotation, and a plurality of circumferentially spaced current conducting springs connecting and acting axially between said other spaced and intermediate discs for urging said intermediate disc into said sliding contact with said one spaced disc, certain of said springs encircling and being positioned by said interfitting means.

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