~~What is Claimed is:~~

1. A rescue machine for tunnel collapse, characterized in that, said rescue machine comprises a cutting head with adjustable diameter, a spiral conveyor shaft, a driving unit for rotating the spiral conveyor shaft, a rescue tube, a propulsion system, a hydraulic pump station, a base frame, a power distribution unit and a control unit, wherein said spiral conveyor shaft is received inside said rescue tube and defines a shaft gap between an inner surface of said rescue tube and said spiral conveyor shaft; said cutting head with adjustable diameter is secured into position through a connecting disc at a front end of the spiral conveyor shaft; said driving unit for rotating the spiral conveyor shaft is positioned on top of said sliding base; said spiral conveyor shaft has a rear end connected to said driving unit for rotating the spiral conveyor shaft; said sliding base and said base frame are connected through a sliding pair unit provided along a longitudinal direction of said base frame; said propulsion system comprises a propulsion cylinder and a propulsion cylinder support frame provided at a rear end of said base frame; said propulsion cylinder has two proximal ends which are connected to said propulsion cylinder support frame and said base frame respectively; said hydraulic pump station comprises a tank, a pump station motor, a hydraulic pump and a valve unit in which said pump station motor drives said hydraulic pump and pressure from said hydraulic pump is passed to said propulsion cylinder through pipeline and said valve unit; said control unit comprises a control member which is connected to control terminals of said driving unit for rotating the spiral conveyor shaft, said pump station motor and said valve unit; said power distribution unit provides power supply to said cutting head with adjustable diameter, said driving unit for rotating the spiral conveyor shaft, said pump station motor and said valve unit; said cutting head with adjustable diameter comprises a cutting disc, a cutting member provided on the cutting disc, a side blade, an extendable and retractable mechanism for side blade connected to said side blade, a hydraulic control member, wherein said extendable and retractable mechanism for side blade is mounted inside an output groove of said cutting disc and is driven by a driving cylinder of said hydraulic control member.

2. The rescue machine for tunnel collapse according to claim 1, characterized in that, said driving unit for rotating the spiral conveyor shaft comprises a driving motor and a hollow shaft reducer, said driving motor is positioned on said sliding base, and an output shaft of said hollow shaft reducer is connected to an rear end of said spiral conveyor shaft through a shaft coupling unit.

3. The rescue machine for tunnel collapse according to claim 1, characterized in that, said spiral conveyor shaft includes a hollow shaft and a spiral conveyor which is constructed by steel plate and is welded to an outer side of said hollow shaft; said rescue machine comprises an auxiliary arrangement for said spiral conveyor shaft, which comprises an electric winch, a steel rope, a mandrel and a bearing base, wherein said bearing base is cylindrical in shape and is welded to a front end of said hollow shaft, and said connecting disc of said cutting head with adjustable diameter is welded to a front end of the bearing base 31; said bearing base comprises a bearing member and a mandrel at an inner ring of said bearing member, said mandrel comprises an angular contact bearings at a mid-rear portion of said mandrel, said angular contact bearings has an inner ring which is transition fit to said mandrel and an outer ring which is interference fit to said bearing base, said bearing base comprises a collar member at a front end of said bearing base, and a thrust bearings is provided between a front end of said mandrel and said collar member, said electric winch is secured on said sliding base, and said steel rope have a first end winding to a reel of said electric winch and a second end opposite to said first end connected to the rear end of the mandrel.

4. The rescue machine for tunnel collapse according to claim 1, characterized in that, said rescue machine comprises a squirrel-cage thrust frame having a first end securely connected to a front end of said hollow shaft reducer and a second end opposite to said first end connected to a rear end of the rescue tube through an adapter unit for rescue tube; and a shaft coupling unit provided inside said squirrel-cage thrust frame.

5. The rescue machine for tunnel collapse according to claim 1, characterized in that, said rescue machine comprises an auxiliary cylinder support frame secured on a front end of said base frame; an auxiliary cylinder secured on said auxiliary cylinder

support frame, wherein a piston of said auxiliary cylinder is complement to said adapter unit for rescue tube, wherein a vertical distance between said piston of said auxiliary cylinder and the center line of said rescue tube is smaller than a distance between the edge of said adaptor unit for rescue tube and the center line of said rescue tube.

6. The rescue machine for tunnel collapse according to claim 3, 4 or 5, characterized in that, said sliding pair unit comprises a sliding rail on said base frame along the longitudinal direction of said base frame and a sliding unit on said sliding base at a bottom portion of said sliding base complement to said sliding rail on said base frame for forming said sliding pair unit.

7. The rescue machine for tunnel collapse according to claim 6, characterized in that, said spiral conveyor shaft comprises at least two conveyor shaft segments connecting together to form said spiral conveyor shaft and said rescue tube comprises at least two rescue tube segments connecting together to form said rescue tube, wherein a length of each of said conveyor shaft segments is 4m~6m and a length of each of said rescue tube segments is 4m~6m.

8. The rescue machine for tunnel collapse according to claim 7, characterized in that, each two said rescue tube segments which are adjacently positioned are connected through a conical connection construction, each of said rescue tube segments has an outer tapered portion at an outer side at a first end and an inner tapered portion at an inner side at a second end opposite to said first end, said outer tapered portion at said outer side at said first end of each said rescue tube segment is complement to said inner tapered portion at said inner side at said second end of each said rescue tube segment, wherein a taper of said outer tapered portion and said inner tapered portion is 1:10~1~15.

9. The rescue machine for tunnel collapse according to claim 8, characterized in that, said base frame comprises two base frame members and a bolt mounting said two frame members together.

10. The rescue machine for tunnel collapse according to claim 3, 4 or 5, characterized in that, said rescue machine comprises a rescue bed, which comprises a bed body, a bed body sliding unit, a hood unit and a safety belt, wherein said hood unit is provided at one end of said bed body through a hinge, said bed body sliding unit is provided at a bottom portion of said bed body and has a cross-section of its outer contour which is semicircular in shape, and said bed body sliding unit has an outer diameter smaller than an inner diameter of said rescue tube.

What is Claimed is:

1. A rescue machine for tunnel collapse, characterized in that, said rescue machine comprises a cutting head with adjustable diameter, a spiral conveyor shaft, a driving unit for rotating the spiral conveyor shaft, a rescue tube, a propulsion system, a hydraulic pump station, a base frame, a power distribution unit and a control unit, wherein said spiral conveyor shaft is received inside said rescue tube and defines a shaft gap between an inner surface of said rescue tube and said spiral conveyor shaft; said cutting head with adjustable diameter is secured into position through a connecting disc at a front end of the spiral conveyor shaft; said driving unit for rotating the spiral conveyor shaft is positioned on top of said sliding base; said spiral conveyor shaft has a rear end connected to said driving unit for rotating the spiral conveyor shaft; said sliding base and said base frame are connected through a sliding pair unit provided along a longitudinal direction of said base frame; said propulsion system comprises a propulsion cylinder and a propulsion cylinder support frame provided at a rear end of said base frame; said propulsion cylinder has two proximal ends which are connected to said propulsion cylinder support frame and said base frame respectively; said hydraulic pump station comprises a tank, a pump station motor, a hydraulic pump and a valve unit in which said pump station motor drives said hydraulic pump and pressure from said hydraulic pump is passed to said propulsion cylinder through pipeline and said valve unit; said control unit comprises a control member which is connected to control terminals of said driving unit for rotating the spiral conveyor shaft, said pump station motor and said valve unit; said power distribution unit provides power supply to said cutting head with adjustable diameter, said driving unit for rotating the spiral conveyor shaft, said pump station motor and said valve unit; said cutting head with adjustable diameter comprises a cutting disc, a cutting member provided on the cutting disc, a side blade, an

extendable and retractable mechanism for side blade connected to said side blade, a hydraulic control member, wherein said extendable and retractable mechanism for side blade is mounted inside an output groove of said cutting disc and is driven by a driving cylinder of said hydraulic control member, wherein said spiral conveyor shaft includes a hollow shaft and a spiral conveyor which is constructed by steel plate and is welded to an outer side of said hollow shaft; said rescue machine comprises an auxiliary arrangement for said spiral conveyor shaft, which comprises an electric winch, a steel rope, a mandrel and a bearing base, wherein said bearing base is cylindrical in shape and is welded to a front end of said hollow shaft, and said connecting disc of said cutting head with adjustable diameter is welded to a front end of the bearing base 31; said bearing base comprises a bearing member and a mandrel at an inner ring of said bearing member, said mandrel comprises an angular contact bearings at a mid-rear portion of said mandrel, said angular contact bearings has an inner ring which is transition fit to said mandrel and an outer ring which is interference fit to said bearing base, said bearing base comprises a collar member at a front end of said bearing base, and a thrust bearings is provided between a front end of said mandrel and said collar member, said electric winch is secured on said sliding base, and said steel rope have a first end winding to a reel of said electric winch and a second end opposite to said first end connected to the rear end of the mandrel.

2. A rescue machine for tunnel collapse, characterized in that, said rescue machine comprises a cutting head with adjustable diameter, a spiral conveyor shaft, a driving unit for rotating the spiral conveyor shaft, a rescue tube, a propulsion system, a hydraulic pump station, a base frame, a power distribution unit and a control unit, wherein said spiral conveyor shaft is received inside said rescue tube and defines a shaft gap between an inner surface of said rescue tube and said spiral conveyor shaft; said cutting head with adjustable diameter is secured into position through a connecting disc at a front end of the spiral conveyor shaft; said driving unit for rotating the spiral conveyor shaft is positioned on top of said sliding base; said spiral conveyor shaft has a rear end connected to said driving unit for rotating the

spiral conveyor shaft; said sliding base and said base frame are connected through a sliding pair unit provided along a longitudinal direction of said base frame; said propulsion system comprises a propulsion cylinder and a propulsion cylinder support frame provided at a rear end of said base frame; said propulsion cylinder has two proximal ends which are connected to said propulsion cylinder support frame and said base frame respectively; said hydraulic pump station comprises a tank, a pump station motor, a hydraulic pump and a valve unit in which said pump station motor drives said hydraulic pump and pressure from said hydraulic pump is passed to said propulsion cylinder through pipeline and said valve unit; said control unit comprises a control member which is connected to control terminals of said driving unit for rotating the spiral conveyor shaft, said pump station motor and said valve unit; said power distribution unit provides power supply to said cutting head with adjustable diameter, said driving unit for rotating the spiral conveyor shaft, said pump station motor and said valve unit; said cutting head with adjustable diameter comprises a cutting disc, a cutting member provided on the cutting disc, a side blade, an extendable and retractable mechanism for side blade connected to said side blade, a hydraulic control member, wherein said extendable and retractable mechanism for side blade is mounted inside an output groove of said cutting disc and is driven by a driving cylinder of said hydraulic control member, wherein said rescue machine comprises a squirrel-cage thrust frame having a first end securely connected to a front end of said hollow shaft reducer and a second end opposite to said first end connected to a rear end of the rescue tube through an adapter unit for rescue tube; and a shaft coupling unit provided inside said squirrel-cage thrust frame.

3. A rescue machine for tunnel collapse, characterized in that, said rescue machine comprises a cutting head with adjustable diameter, a spiral conveyor shaft, a driving unit for rotating the spiral conveyor shaft, a rescue tube, a propulsion system, a hydraulic pump station, a base frame, a power distribution unit and a control unit, wherein said spiral conveyor shaft is received inside said rescue tube and defines a shaft gap between an inner surface of said rescue tube and said spiral conveyor shaft;

said cutting head with adjustable diameter is secured into position through a connecting disc at a front end of the spiral conveyor shaft; said driving unit for rotating the spiral conveyor shaft is positioned on top of said sliding base; said spiral conveyor shaft has a rear end connected to said driving unit for rotating the spiral conveyor shaft; said sliding base and said base frame are connected through a sliding pair unit provided along a longitudinal direction of said base frame; said propulsion system comprises a propulsion cylinder and a propulsion cylinder support frame provided at a rear end of said base frame; said propulsion cylinder has two proximal ends which are connected to said propulsion cylinder support frame and said base frame respectively; said hydraulic pump station comprises a tank, a pump station motor, a hydraulic pump and a valve unit in which said pump station motor drives said hydraulic pump and pressure from said hydraulic pump is passed to said propulsion cylinder through pipeline and said valve unit; said control unit comprises a control member which is connected to control terminals of said driving unit for rotating the spiral conveyor shaft, said pump station motor and said valve unit; said power distribution unit provides power supply to said cutting head with adjustable diameter, said driving unit for rotating the spiral conveyor shaft, said pump station motor and said valve unit; said cutting head with adjustable diameter comprises a cutting disc, a cutting member provided on the cutting disc, a side blade, an extendable and retractable mechanism for side blade connected to said side blade, a hydraulic control member, wherein said extendable and retractable mechanism for side blade is mounted inside an output groove of said cutting disc and is driven by a driving cylinder of said hydraulic control member, wherein said rescue machine comprises an auxiliary cylinder support frame secured on a front end of said base frame; an auxiliary cylinder secured on said auxiliary cylinder support frame, wherein a piston of said auxiliary cylinder is complement to said adapter unit for rescue tube, wherein a vertical distance between said piston of said auxiliary cylinder and the center line of said rescue tube is smaller than a distance between the edge of said adaptor unit for rescue tube and the center line of said rescue tube.

4. The rescue machine for tunnel collapse according to claim 1, 2 or 3, characterized in that, said sliding pair unit comprises a sliding rail on said base frame along the longitudinal direction of said base frame and a sliding unit on said sliding base at a bottom portion of said sliding base complement to said sliding rail on said base frame for forming said sliding pair unit.

5. The rescue machine for tunnel collapse according to claim 4, characterized in that, said spiral conveyor shaft comprises at least two conveyor shaft segments connecting together to form said spiral conveyor shaft and said rescue tube comprises at least two rescue tube segments connecting together to form said rescue tube, wherein a length of each of said conveyor shaft segments is 4m~6m and a length of each of said rescue tube segments is 4m~6m.

6. The rescue machine for tunnel collapse according to claim 5, characterized in that, each two said rescue tube segments which are adjacently positioned are connected through a conical connection construction, each of said rescue tube segments has an outer tapered portion at an outer side at a first end and an inner tapered portion at an inner side at a second end opposite to said first end, said outer tapered portion at said outer side at said first end of each said rescue tube segment is complement to said inner tapered portion at said inner side at said second end of each said rescue tube segment, wherein a taper of said outer tapered portion and said inner tapered portion is 1:10~1~15.

7. The rescue machine for tunnel collapse according to claim 6, characterized in that, said base frame comprises two base frame members and a bolt mounting said two frame members together.

8. The rescue machine for tunnel collapse according to claim 1, 2 or 3, characterized in that, said rescue machine comprises a rescue bed, which comprises a bed body, a bed body sliding unit, a hood unit and a safety belt, wherein said hood

unit is provided at one end of said bed body through a hinge, said bed body sliding unit is provided at a bottom portion of said bed body and has a cross-section of its outer contour which is semicircular in shape, and said bed body sliding unit has an outer diameter smaller than an inner diameter of said rescue tube.

9. The rescue machine for tunnel collapse according to claim 1, 2, 3, 4, 5, 6, 7 or 8, characterized in that, said driving unit for rotating the spiral conveyor shaft comprises a driving motor and a hollow shaft reducer, said driving motor is positioned on said sliding base, and an output shaft of said hollow shaft reducer is connected to an rear end of said spiral conveyor shaft through a shaft coupling unit.