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Wang(10) **Pub. No.: US 2019/0249674 A1**(43) **Pub. Date: Aug. 15, 2019**(54) **COMBINED SUMP PUMP WITH A BACKUP
PUMP STRUCTURE****F04D 15/00** (2006.01)**F04D 13/06** (2006.01)(71) Applicant: **GP Enterprises Co., Ltd**, Suzhou (CN)(52) **U.S. Cl.****CPC** **F04D 15/029** (2013.01); **F04D 13/06**
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13/12 (2013.01)(72) Inventor: **Xian Wang**, Suzhou (CN)(21) Appl. No.: **16/241,950**

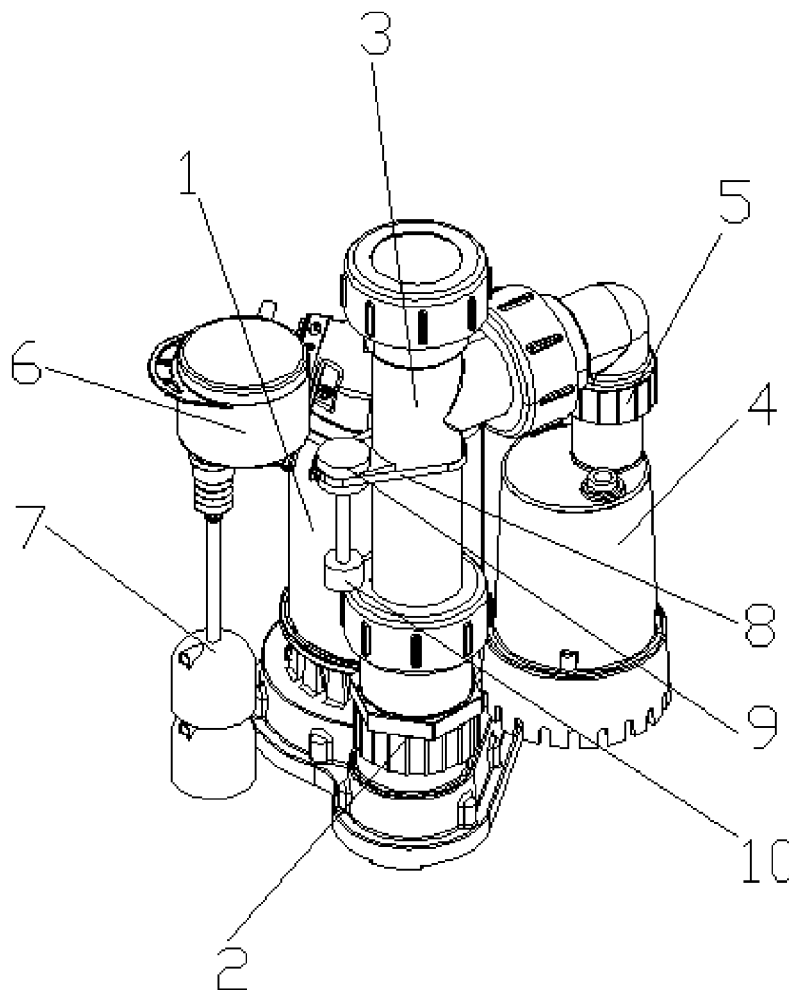
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ABSTRACT(22) Filed: **Jan. 7, 2019****Related U.S. Application Data**(63) Continuation of application No. PCT/CN2018/
076282, filed on Feb. 11, 2018.(30) **Foreign Application Priority Data**

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A combined sump pump with a backup pump structure includes a primary pump, a check valve device for the primary pump, a pipeline connection device arranged on one side of the primary pump and the backup pump, a backup pump, and a check valve device for the backup pump; the primary pump and the pipeline connection device are connected by the check valve of the primary pump, the backup pump and the pipeline connection device are connected by the check valve of the backup pump; the primary pump is equipped with a primary pump float switch, a primary pump float ball is provided under the primary pump float switch, a backup pump hoop is provided on the pipeline connection device, a backup pump float switch is provided on the backup pump hoop, and a backup pump float ball is provided under the backup pump float switch.



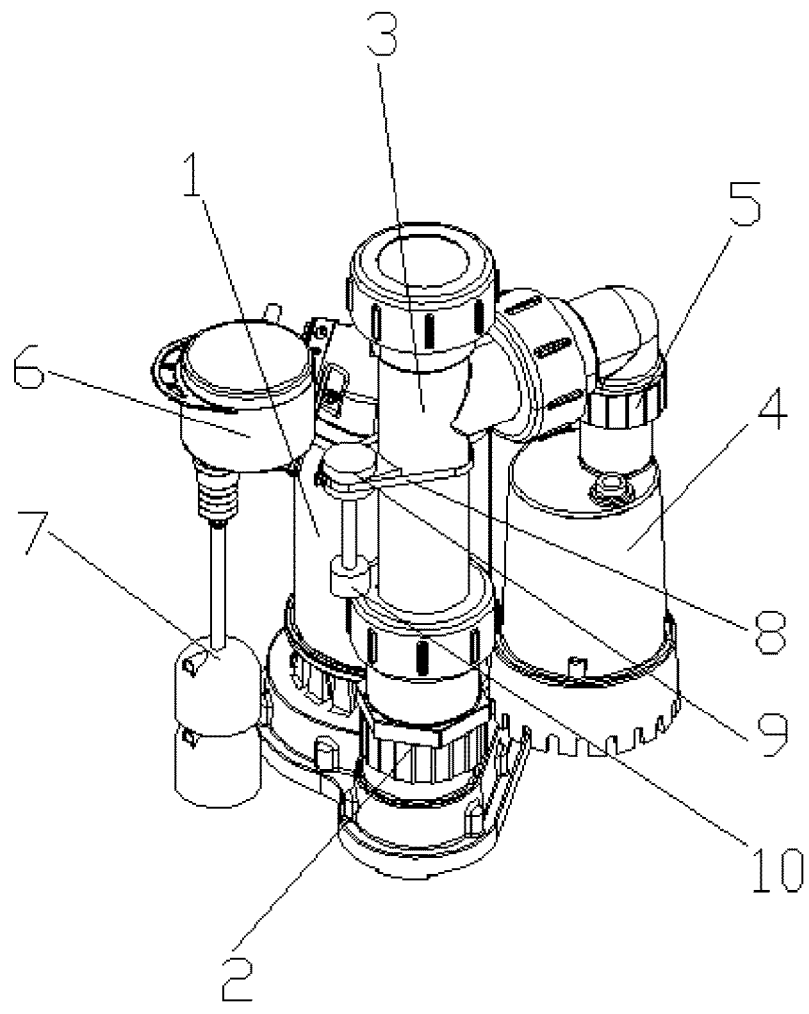


Fig. 1

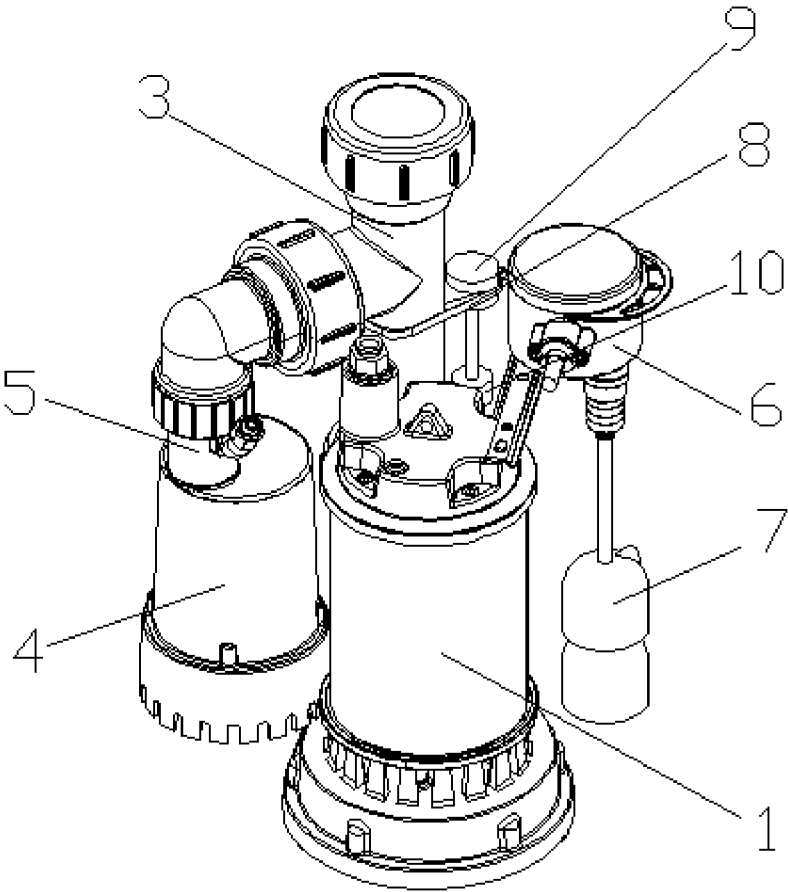


Fig. 2

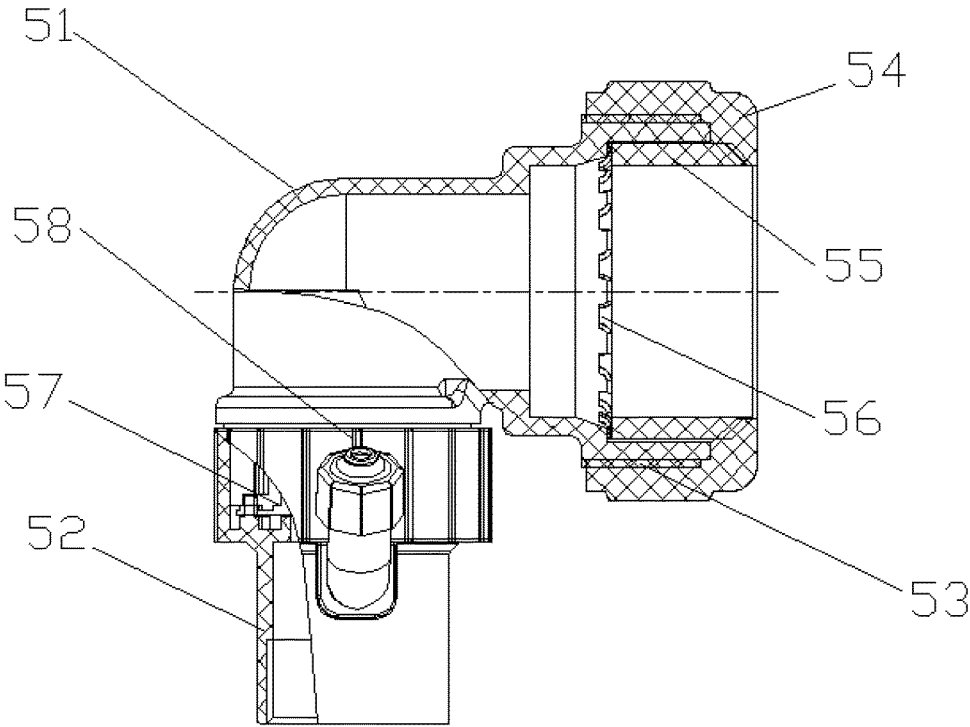


Fig. 4

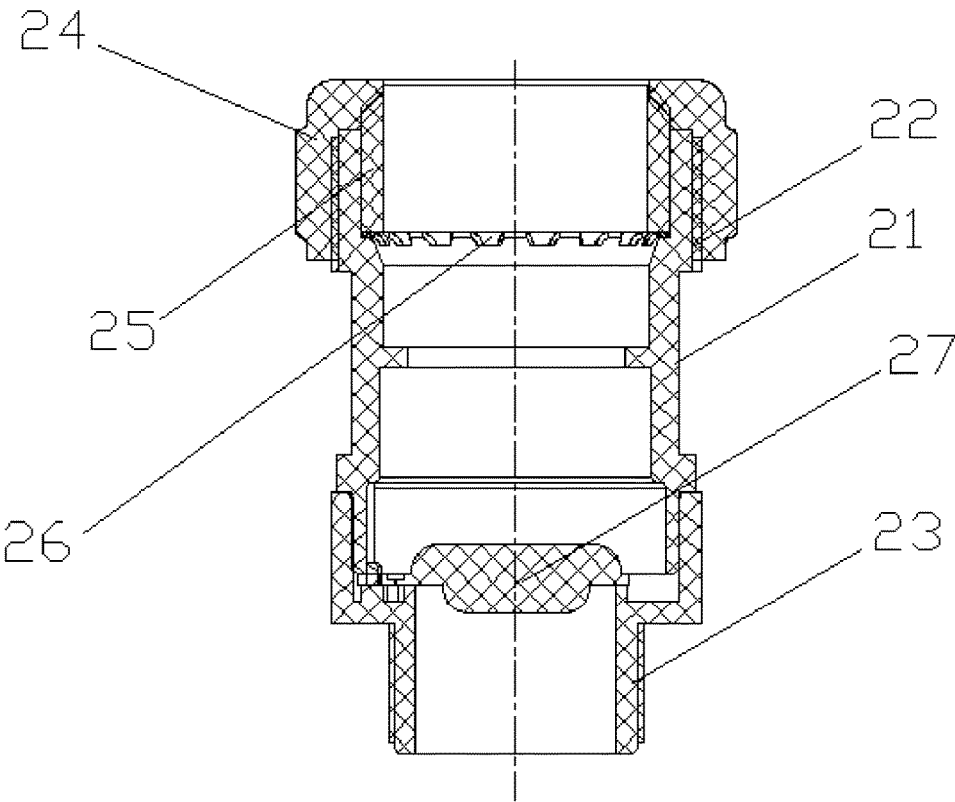


Fig. 5

COMBINED SUMP PUMP WITH A BACKUP PUMP STRUCTURE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation application of PCT Application No. PCT/CN2018/076282 filed on Feb. 11, 2018, which claims priority to Chinese Patent Application No. 201810094547.0 filed on Jan. 31, 2018. The entire contents of all of the above are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention relates to the field of processing and manufacturing household sump pumps, and more particularly to a combined sump pump with a new type of backup pump structure.

BACKGROUND OF THE INVENTION

[0003] Domestic sewage or groundwater drains into the basement pit in North American households is mainly discharged into the sewers or municipal storm drain through pumps, in the case of failure of pumps or power outages, the excess water will overflow to flood the basement to cause big economic losses.

[0004] Integrating a DC motor pump powered by a battery into the primary pump, during the period of power outage or failure of the primary pump, the backup pump begins to work as soon as the water level reaches the backup pump activate point and it prevents water from flooding damage.

[0005] However, at present, this type of pump on the market is complex on pipeline connecting, it requires professional plumber to install at consumers' expense, or consumers do themselves ending at an unreliable connection, which affects the promotion and use of combined pumps badly.

SUMMARY OF THE INVENTION

[0006] The main technical problem to be solved by the invention is to provide a combined sump pump with a new type of backup pump structure, which is easy for management, cost saving and convenient for customers to use, install and overhaul.

[0007] In order to solve the above technical problem, the present invention adopts a technical solution: providing a combined sump pump with a new type of backup pump structure, which includes: a primary pump, a check valve device for the primary pump, a set of pipeline connection device, a backup pump, and a check valve device for the backup pump; wherein the pipeline connection device is arranged on one side of the primary pump and the backup pump; wherein the primary pump and the pipeline connection device are connected by the check valve of the primary pump; wherein the backup pump and the pipeline connection device are connected by the check valve of the backup pump; wherein the primary pump is equipped with a primary pump float switch; wherein a primary pump float ball is provided under the primary pump float switch, wherein a backup pump hoop is provided on the pipeline connection device; wherein a backup pump float switch is provided on the backup pump clamp; and wherein a backup pump float ball is provided on the backup pump float switch; wherein the check valve device for the backup pump comprises an

elbow pipe, two ends of the elbow pipe are respectively provided with a backup pump pipe joint and a backup pump joint; wherein the check valve device for the primary pump comprises a valve body, two ends of the valve body are respectively provided with a primary pump joint and a primary pump press joint.

[0008] In a preferred embodiment of the present invention, the backup pump comprises a pump housing, wherein a diffuser is arranged at the lower part of the pump housing, a DC motor is arranged inside of the pump housing, an impeller is arranged under the DC motor, and wherein the impeller is connected to the DC motor being driven thereby, a skeleton oil seal is arranged between the impeller and the DC motor, a flange is disposed on the side of the skeleton oil seal, and an outlet formed at the top of the pump housing.

[0009] In a preferred embodiment of the present invention, wherein a backup pump compression pipe is provided on the outer wall of the backup pump joint; wherein a backup pump rubber seal ring is provided on the inner wall of the backup pump joint; a backup pump metal clip ring is arranged on one side of the backup pump rubber seal ring and located inside of the elbow pipe, a valve flapper is arranged inside of the elbow pipe, and a curved nozzle is arranged on the outer wall of the elbow pipe.

[0010] In a preferred embodiment of the present invention, wherein a primary pump compression pipe is provided on the outer wall of the primary pump joint; wherein a primary pump rubber seal ring is provided on the inner wall of the primary pump joint; with a primary pump metal clip ring is arranged below the primary pump rubber seal ring, and a check valve plate is provided inside of the valve body.

[0011] In a preferred embodiment of the present invention, at least one floating ball of the primary pump is provided.

[0012] In a preferred embodiment of the present invention, an internal cavity is arranged between the DC motor and the pump housing.

[0013] In a preferred embodiment of the present invention, the backup pump inlet is higher than the primary pump inlet.

[0014] In a preferred embodiment of the present invention, the backup pump is a type of axial flow structure or a type of centrifugal structure.

[0015] In a preferred embodiment of the present invention, the pipeline connection device can be, but is not limited to, three-way straight pipes.

[0016] In a preferred embodiment of the present invention, the installation position of the backup pump float switch is higher than the activation water level of the primary pump float switch.

[0017] The beneficial effect of the invention is: The present invention indicates that a combined sump pump with a new type of backup pump structure has the following advantages:

[0018] 1. The primary pump and the backup pump are directly connected by a three-way straight pipe or other pipeline connection device, the various complex pipeline connection devices are molded into a whole, and the connection parts are integrated into an integrated part which makes connection more reliable.

[0019] 2. The combined sump pump disclosed by the present invention, the pipeline installation is simple, and the installation volume of the backup pump was greatly reduced.

[0020] 3. In the backup pump design of the present invention, the centrifugal impeller is applied in the

axial flow structure, in such, the applying scope of the centrifugal impeller is expanded, and the problem of the low lift and the inability to transport sewage media of axial impeller is resolved, in fact, centrifugal or axial flow structures could be selected according to different needs.

[0021] 4. The primary pump preferably adopts the twin-float switch which is more convenient to adjust the water level and to prevent foreign matter from blocking the float ball. Actually, the single float ball, three or multiple float ball structures can be selected according to the production cost and customer needs.

[0022] 5. Integrated check valve structure, easy and reliable connection, while the primary pump or backup pump are operating, the water will not backflow to another pump.

[0023] 6. The present invention provides a combined sump pump with a new type of backup pump structure, which is easy for management, cost saving and convenient for customers to use, install and overhaul.

BRIEF DESCRIPTION OF THE FIGURES

[0024] In order to more clearly illustrate the technical solutions in the embodiments of the present invention, the drawings used in the description of the embodiments will be briefly described below. Obviously, the drawings in the following description are merely some embodiments of the present invention. For those who skilled in the art, other drawings may also be obtained based on these drawings without paying any creative work. Therein:

[0025] FIG. 1 is a schematic structural view of a preferred embodiment of the combined sump pump with a new type of backup pump structure of the present invention;

[0026] FIG. 2 is a side structural schematic diagram of a preferred embodiment of the combined sump pump with a new type of backup pump structure of the present invention;

[0027] FIG. 3 is an internal structural schematic diagram of the backup pump of a preferred embodiment of the combined sump pump with a new type of backup pump structure of the present invention;

[0028] FIG. 4 is a structural schematic diagram of the check valve device for the backup pump of a preferred embodiment of the combined sump pump with a new type of backup pump structure of the present invention;

[0029] FIG. 5 is a structural schematic diagram of the check valve device for the primary pump of a preferred embodiment of the combined sump pump with a new type of backup pump structure of the present invention;

[0030] As shown in the figure: 1. Primary pump; 2. Check valve device for the primary pump; 3. Three-way straight pipe; 4. Backup pump; 5. Check valve device for the backup pump; 6. Float switch for the primary pump; 7. Float ball for the primary pump; 8. Backup pump hoop; 9. Float switch for the backup pump; 10. Float ball for the backup pump; 41. Pump housing; 42. Diffuser; 43. DC motor; 44. Impeller; 45. Skeleton oil seal; 46. Flange; 47. Outlet; 48. Internal cavity; 51. Elbow pipe; 53. Backup pump joint; 54. Backup pump compression pipe; 55. Backup pump rubber seal ring; 56. Backup pump metal clip ring; 57. Valve flapper; 58. Curved nozzle; 21. Valve body; 22. Primary pump joint; 23. Primary pump compression joint; 25. Primary pump rubber seal ring; 26. Primary pump metal clip ring; 27. Check valve plate.

DETAILED DESCRIPTION

[0031] The following clearly and completely describes the technical solution in the embodiment of the invention. Obviously, the embodiment described is only one part of the embodiment of the invention and not all the embodiments. Based on the embodiment in the invention, all other embodiments obtained by the general technicians in the field without creative labor are within the scope of protection of the invention.

[0032] See FIG. 1-5. The embodiments of the invention include:

[0033] A combined sump pump with a new type of backup pump structure, which includes: a primary pump 1, a check valve device for the primary pump 2, a three-way straight pipe 3, a backup pump 4, and a check valve device for the backup pump 5. The three-way straight pipe 3 is one of types of pipe connecting devices. The three-way straight pipe 3 is arranged on one side of the primary pump 1 and the backup pump 4. The primary pump 1 and the three-way straight pipe are connected by the check valve for the primary pump 2. The backup pump 4 and the three-way straight pipe 3 are connected by the check valve for the backup pump 5. Multiple connection parts are integrated into one part which is more reliable, and no professional is required on installation, users can install and connect pipeline devices themselves, and maintenance is convenient, saving on manual installation and maintenance costs. The backup pump 4 inlet is higher than the primary pump inlet. The backup pump 4 is directly connected to the elbow pipe 51 by a quick-connection fitting so no need of a supporting base thereof. The user does not need to use any assembly tools so the installation room is reduced. The production cost is reduced as well. And the application range is expanded. The primary pump 1 is equipped with a primary pump float switch 6. A primary pump float ball 7 is provided under the primary pump float switch 6. The primary pump float ball 7 is a twin-float, and the adjustment speed of the twin-float is faster than a single float, meanwhile, the twin-float can prevent the foreign substance from blocking the float ball. A backup pump hoop 8 is provided on the three-way straight pipe 3. A backup pump float switch 9 is provided on the backup pump hoop 8. And a backup pump float ball 10 is provided under the backup pump float switch 9. The installation position of the backup pump float switch 9 is higher than the activation water level of the primary pump float switch 6, in this way, when the primary pump 1 stops running due to failure, and the water level reaches the activation water level of the backup pump float switch 9, the backup pump 4 starts running.

[0034] The backup pump 4 is an axial flow structure, which can actually apply a centrifugal or an axial flow structure according to customer's needs and the structure. The backup pump 4 includes: a pump housing 41, a diffuser 42 is arranged at the lower part of the pump housing 41. A DC motor 43 is arranged inside of the pump housing 41. The impeller 44 is arranged below the DC motor 43, and the impeller 44 is connected to the DC motor 43 drive shaft. The open centrifugal impeller applies the axial flow structure to change the direction of the fluid at the exit of the impeller 44 through the diffuser 42, so that the fluid movement changes from radial direction to axial direction, which at the same time solves the problem of the traditional axial flow impeller low lift and unable to transport sewage media. The skeleton oil seal 45 is disposed between the impeller 44 and the DC

motor 43. A flange 46 is arranged on the side of the skeleton oil seal 45. And an outlet 47 is arranged at the top of the pump housing 41. The internal cavity 48 is formed between the DC motor 43 and the pump housing 41, liquid media is transported through the cavity which formed between the pump housing and the internal motor, in such design, the backup pump volume is reduced, the production cost is reduced, and the application range is extended.

[0035] The check valve device 5 for the backup pump includes: the elbow pipe 51, two ends of the elbow pipe 51 are respectively provided with a backup pump pipe joint 52 and a backup pump joint 53. The backup pump pipe joint 52 is used to connect to the backup pump outlet via thread. The outer wall of the backup pump joint 53 is provided with a backup pump compression pipe 54 which is used to match backup pump joint 53, fastening and sealing through threaded connection, the inner wall of the backup pump joint 53 is provided with a backup pump rubber seal ring 55 for fastening and sealing. The backup pump metal clip ring 56 is arranged on one side of the backup pump rubber seal ring 55 and inside the elbow pipe 51 for positioning and axially stopping to prevent the backup pump rubber ring 55 from being squeezed into the internal line of check valve. The valve flapper 57 is arranged inside the elbow pipe 51, while the backup pump 4 is running, the valve flapper 57 is pushed open by the water flow; when the backup pump 4 stops running, the valve flapper 57 automatically closes to prevent the water flow from pouring back into the backup pump 4 body. The outer wall of the elbow pipe 51 is provided with a curved nozzle 58 for the internal exhaust of the backup pump 4.

[0036] The check valve device 2 for the primary pump includes: valve body 21, two ends of the valve body 21 are provided with the primary pump joint 22 and the primary pump compression joint 23. The primary pump compression joint 23 is used for connecting with the primary pump outlet via thread. The outer wall of the primary pump joint 22 is provided with the primary pump compression pipe 24 which is used to match the primary pipe connector 22, fastening and sealing through threaded connection. The inner wall of the primary pump joint 22 is provided with a primary pump rubber seal ring 25 for fastening and sealing. The primary pump metal clip ring 26 is arranged below the primary pump rubber seal ring 25, for positioning and axially stopping to prevent the primary pump rubber ring 25 from being squeezed into the internal line of check valve. The inside of the valve body 21 is provided with a check valve plate 27, while the primary pump 1 is running, the check valve plate 27 is pushed open by the water flow, the light weight check valve plate does not affect the primary pump running. When the primary pump 1 stop running and the backup pump 4 starts to run, the check valve plate 27 automatically closes to prevent the water from backflowing into the primary pump 1 body.

[0037] In the specific implementation, in the normal operating condition, when the primary pump 1 operates, the backup pump 4 is closed; the primary pump 1 outlet is connected to the check valve device 2 for the primary pump. And the check valve device 2 for the primary pump is integrated with a three-way straight pipe 3 to be a integrated part, one-piece structure for users to install by themselves which saves the cost of manual installation. The backup pump 4 also has a check valve device 5, so when the primary pump 1 is running, the check valve device 5 for backup

pump prevents the water from backflowing into the pump body of the backup pump 4. When the primary pump 1 stop running and the water level reaches a certain height, the backup pump float switch 9 activates the backup pump 4. And the backup pump 4 power cord is connected to a specialized backup power supply, therefore, when an emergency such as the primary pump 1 failure or a power outage occurs, the backup pump 4 operation will not be affected. When the backup pump 4 is running, the check valve device 2 for the primary pump will also prevent the water from backflowing into the pump body of the primary pump 1.

[0038] In summary, the present invention which provides a combined sump pump with a new type of backup pump structure has the following advantages:

[0039] 1. The pipeline connection device is designed as three-way straight pipe styles, the primary pump and the backup pump are directly connected by three-way straight pipe and elbow pipe, multiple connection parts are integrated into a integrated part and the connection is more reliable.

[0040] 2. The present invention relates to a combined sump pump, in which the pipeline device installation is simple, and installation room of the backup pump is greatly reduced.

[0041] 3. The centrifugal impeller is successfully applied in the axial flow structure, in such, the applying scope of the centrifugal impeller is expanded, and the problem of the low lift and the inability to transport sewage media of axial impeller is resolved, in fact, centrifugal or axial flow structures could be selected according to different needs.

[0042] 4. The primary pump preferably adopts the twin-float switch, the twin-float switch is more convenient to adjust the water level and can prevent foreign matter from blocking the float ball;

[0043] 5. Integrated check valve structure, easy and reliable connection, while the primary pump or backup pump are operating, the water will not backflow to another pump;

[0044] 6. The present invention relates to a combined sump pump, which is convenient for management, cost saving, and convenient for customers to use for installation and overhaul.

[0045] The foregoing descriptions are merely embodiments of the present invention, and therefore do not mean to limit the scope of the present invention. Any implementation on the content of the present specification by using an alternative structure or equivalent process transformation, or, a direct or indirect application in the same field or in other related technical fields are in the protection scopes of the present invention.

What is claimed is:

1. A combined sump pump with a backup pump structure, comprising a primary pump, a check valve device for the primary pump, a set of pipeline connection device, a backup pump, and a check valve device for the backup pump; wherein the pipeline connection device is arranged on one side of the primary pump and the backup pump; wherein the primary pump and the pipeline connection device are connected by the check valve of the primary pump; wherein the backup pump and the pipeline connection device are connected by the check valve of the backup pump; wherein the primary pump is equipped with a primary pump float switch; wherein a primary pump float ball is provided under the

primary pump float switch; wherein a backup pump hoop is provided on the pipeline connection device; wherein a backup pump float switch is provided on the backup pump hoop; and wherein a backup pump float ball is provided under the backup pump float switch; wherein the check valve device for the backup pump comprises an elbow pipe, two ends of the elbow pipe are respectively provided with a backup pump pipe joint and a backup pump joint; wherein the check valve device for the primary pump comprises a valve body, two ends of the valve body are respectively provided with a primary pump joint and a primary pump pressure joint.

2. The combined sump pump with a backup pump structure according to claim 1, characterized in that the backup pump comprises a pump housing, wherein a diffuser is arranged at the lower part of the pump housing, a DC motor is arranged inside of the pump housing, an impeller is arranged under the DC motor, and wherein the impeller is connected to the DC motor and being driven thereby, a skeleton oil seal is arranged between the impeller and the DC motor, a flange is disposed on the side of the skeleton oil seal, and an outlet formed at the top of the pump housing.

3. The combined sump pump with a backup pump structure according to claim 1, characterized in that a backup pump compression pipe is provided on the outer wall of the backup pump joint, a backup pump rubber seal ring is provided on the inner wall of the backup pump joint, a backup pump metal clip ring is arranged on one side of the backup pump rubber seal ring and located inside of the elbow pipe, a valve flapper is arranged inside of the elbow pipe, and a curved nozzle is arranged on the outer wall of the elbow pipe.

4. The combined sump pump with a backup pump structure according to claim 1, characterized in that a primary pump compression pipe is provided on the outer wall of the primary pump connector, a primary pump rubber seal ring is provided on the inner wall of the primary pump connector, a primary pump metal clip ring is arranged below the primary pump rubber seal ring, and a check valve plate is provided inside of the valve body.

5. The combined sump pump with a backup pump structure according to claim 1, characterized in that at least one floating ball of the primary pump is provided.

6. The combined sump pump with a backup pump structure according to claim 1, characterized in that an internal cavity is arranged between the DC motor and the pump housing.

7. The combined sump pump with a backup pump structure according to claim 1, characterized in that the backup pump inlet is higher than the primary pump inlet.

8. The combined sump pump with a backup pump structure according to claim 1, characterized in that the backup pump is a type of axial flow structure or a type of centrifugal structure.

9. The combined sump pump with a backup pump structure according to claim 1, characterized in that the pipeline connection device being three-way straight pipes.

10. The combined sump pump with a backup pump structure according to claim 1, characterized in that the installation position of the backup pump float switch is higher than the activation water level of the primary pump float switch.

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