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Building construction machinery and equipment — Concrete pumps —

Part 1: Terminology and commercial specifications

Machines et matériels pour la construction des bâtiments — Pompes à béton —

Partie 1: Terminologie et spécifications commerciales

Reference number
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Foreword

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ISO 21573-1 was prepared by Technical Committee ISO/TC 195, *Building construction machinery and equipment*, Subcommittee SC 1, *Machinery and equipment for concrete work*.

ISO 21573 consists of the following parts, under the general title *Building construction machinery and equipment — Concrete pumps*:

— *Part 1: Terminology and commercial specifications*

— *Part 2: Procedure for examination of technical parameters*

Introduction

This part of ISO 21573 deals with concrete pumps used on building sites for concrete-mix delivery. It provides definitions and technical characteristics of the relevant machines. The figures in Annex A give examples of current structures of concrete pumps and their principles of operation.

Building construction machinery and equipment — Concrete pumps —

Part 1: Terminology and commercial specifications

1 Scope

This part of ISO 21573 establishes terminology and commercial-literature specifications for concrete pumps which are used on building sites for concrete-mix delivery.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11375:1998, *Building construction machinery and equipment — Terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11375 and the following apply.

3.1
piston-type concrete pump
pump in which a piston is used to impart energy to the concrete mix, with the intent of transporting the mix to and through the conveying pipe and/or hose

See Figure A.1.

3.2
rotary-type concrete pump
pump in which a peristaltic action is used to impart energy to the concrete mix with the intent of transporting the mix to and through the conveying pipe and/or hose

See Figures A.6, A.7, A.8 and A.9.

3.3
stationary-type concrete pump
skid, rail or wheeled-chassis mounted concrete pump intended for long-term operation on one building site

See Figure A.13.

3.4
piston-type concrete-pump's valve system
system composed of cut-off valves successively locking and opening concrete-mix flow from the hopper to the concrete cylinder and from the latter to the conveying pipe

See Figures A.2, A.3, A.4 and A.5.

NOTE The operation of the valves is synchronised so that, when the concrete-mix flow from the hopper to the concrete cylinder is opened, the flow to the conveying pipe is closed. Various types of valve systems (see Table 1) are identified.

3.5
distributing boom
folded boom with fixed concrete-mix conveying pipe of which the role is to deliver concrete mix to work areas within its reach

See Figure A.14.

NOTE The boom has the possibility of folding in the vertical plane and slewing around the vertical axis. Typically, a rubber hose is fixed to the end of the conveying pipe, to facilitate concrete-mix distribution.

3.6
maximum applicable aggregate size
largest size of aggregate that can be consistently delivered through the concrete pump without blockage, including through any conveying pipe that is normally supplied on the finished product

3.7
minimum applicable slump
minimum value of slump applicable for conveying by concrete pump

3.8
maximum theoretical pumping capacity
theoretical delivery volume which is obtained at the maximum strokes/revolutions per minute of concrete pump

NOTE The actual delivery volume is obtained by calculating the product of the volumetric efficiency and the theoretical delivery volume of the concrete pump. Using concrete of slump value 18 cm to 21 cm, the volumetric efficiency is about 90 %.

$$Q_{\text{th}} = \left(\pi \times d^2 / 4\right) \times s \times n \times 10^{-9}$$

$$Q_{\text{a}} = Q_{\text{th}} \times \eta_v$$

where

Q_{th} is the theoretical delivery volume (m^3/h);

Q_{a} is the actual delivery volume (m^3/h);

d is the diameter of the concrete cylinder piston (mm);

s is the stroke (mm);

n is the number of strokes per hour;

η_v is the volumetric efficiency, equal to 0,8 to 0,9.

4 Classification of the concrete pumps

In general terms, concrete pumps are typically classified by the following four main characteristics (see Table 1):

— type of pumping unit;

— mode or frequency of transportation;

— form of conveying;

— concrete-mix delivery with assistance.

Table 1 — Classification of the concrete pumps

Classification	Type	Current examples	Reference Figures
Type of pumping unit	Piston	Hydraulic driven	Figure A.1
		Mechanical driven	—
		Single piston	—
		Multi piston	Figure A.1
	Rotary	Vacuum	Figure A.6, A.7
		Elastic	Figure A.8, A.9
Mode or frequency of transportation	Self-propelled mobile	Truck mounted	ISO 11375, Figure 41
	Non self-propelled mobile	Trailer mounted (with tires on highway)	ISO 11375, Figure 42
		Trailer mounted, steel wheels (rides on rails)	—
		Trailer mounted, track	—
	Stationary	Skid mounted/Fixed in place	Figure A.11
		Trailer mounted (with tires off-road)	ISO 11375, Figure 42
Form of conveying	With integral distribution boom	Truck mounted	ISO 11375, Figure 41
		Trailer mounted	ISO 11375, Figure 43
	With separate distribution boom	Tower mounted boom	ISO 11375, Figure 44
		Articulating distribution arm (with support legs)	—
	With connected conveying line	Pipe and/or hose run from pump to placement	—
Concrete-mix delivery with assistance	With pressurized air	Concrete spraying	—

5 Commercial specifications

5.1 General characteristics

The following characteristics shall be specified:

— model and type;

— manufacturer's name;

— maximum theoretical pumping capacity (m^3/h);

— maximum theoretical pressure in concrete (MPa);

— diameter of concrete pumping cylinder (mm);

— stroke of concrete pumping cylinder (mm);

— number of strokes per minute (min^{-1});

— outlet diameter of concrete valve device (mm);

— capacity of hopper (m^3);

— engine power (kW);

— acceptable leaning angle of the machine during pumping operation (degrees);

— operating mass[1)] (kg).

The manufacturer shall provide means for correlating the machine's theoretical maximum concrete line pressure to the theoretical pumping distance capability.

5.2 Applicable concrete

Specify the following:

— maximum applicable size of aggregate (mm);

— minimum applicable slump value (cm).

1) Specify the mass of the concrete pump under the following conditions:

— ready to run;

— with or without cab (to be stated);

— including standard equipment;

— with a driver of mass 75 kg;

— with fuel tank hall full;

— with cleaning water, cooling, lubrication and hydraulic systems full.

5.3 Drive

Specify the type of the concrete pump's drive:

— by the vehicle engine and additional gear box for hydraulic pump's driving;

— by a separate engine and gear box driving the hydraulic system.

5.4 Dimensional characteristics

Specify the following:

— overall dimensions:

  — length, L (mm);

  — width, W (mm);

  — height, H (mm);

— wheel base, $L1$ (mm);

— hopper height from the ground, $H1$ mm;

— reach of distributing boom (m).

For maximum out-reach of the distributing boom, see Figure A.14.

5.5 Conveying-pipe cleaning device

Specify the following:

— model;

— operation method (water or pneumatic system);

— performance:

  — delivery volume (l/min);

  — delivery pressure (MPa).

5.6 Chassis cleaning device

Specify the following:

— model;

— cleaning-water tank capacity (l).

5.7 Distributing boom

Specify the following:

— model;

— maximum reach in vertical (m);

— maximum reach in horizontal (m);

— swing device:

  — model;

  — swing angles $\alpha, \beta, \gamma, \delta$ (see Figure A.14) (degrees);

— diameter of the conveying pipe on the boom (mm);

— length of the rubber distributing hose (m);

— number of boom sections;

— mass of the distributing boom (kg).

5.8 Outrigger component

Specify the following:

— model;

— maximum extended width:

  — front (mm);

  — rear (mm);

— maximum load capacity of each outrigger.

5.9 Hydraulic system

Specify the following:

a) number of hydraulic pumps;

b) hydraulic oil-tank capacity (l);

c) boom control block (proportional or nominal directional valve).

For each pump specify;

— application (concrete cylinders drive, cutting-off valves drive, distributing boom drive, outriggers drive, hopper agitator drive);

— model;

— delivery volume (l/min);

— delivery pressure (MPa).

5.10 Truck chassis

Specify the following:

- general data;
  - model;
  - load capacity (N);
  - number of axles;
  - maximum permissible load on axles:
    - front (N);
    - rear (N);
- engine characteristics:
  - model;
  - rated output/engine speed (kW/min^{-1});
  - maximum torque/engine speed ($N{\cdot}m/min^{-1}$);
  - displacement (m^3);
- fuel-tank capacity (l).

5.11 Trailer chassis

Specify the following:

- model;
- type of trailer: single or double axles;
- load capacity (N);
- maximum permissible load on axle (N).

For double-axle trailers, specify the permissible maximum load on the front and rear axles.

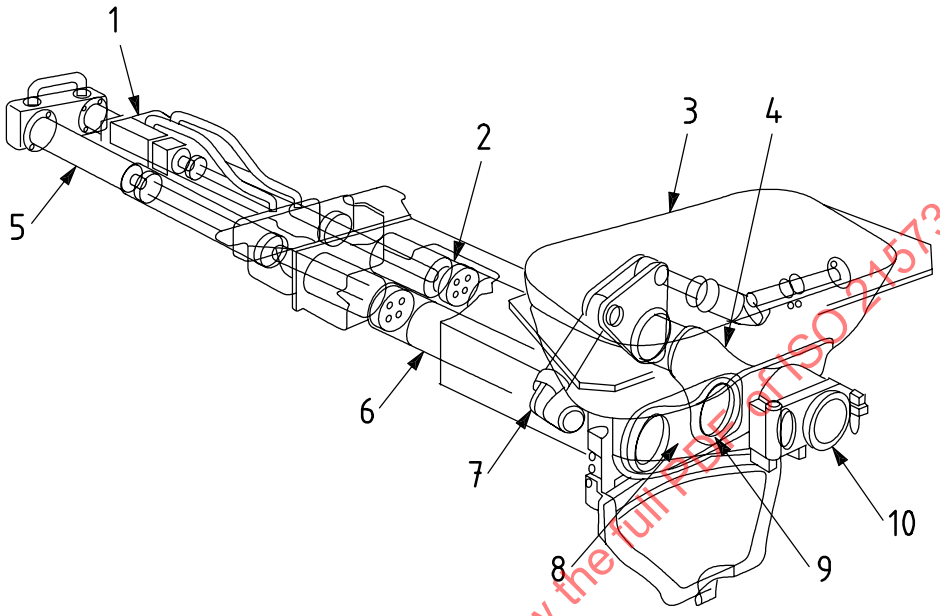
5.12 Attachments and tools

Specify the following:

- remote-control panel (if any);
- operation manual;
- tools;
- spare parts;
- reduction connection for pipeline with clamp.

Annex A
(informative)

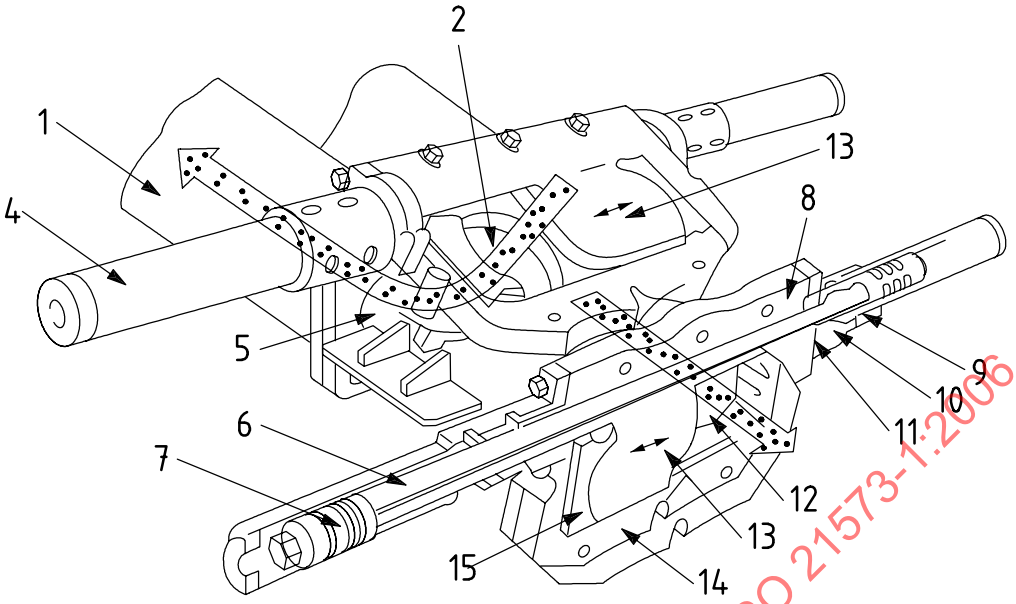
Examples of concrete pump designs and their assemblies



Key

1 hydraulic valve
2 concrete piston
3 concrete hopper
4 swing pipe
5 hydraulic cylinder
6 concrete cylinder
7 hydraulic cylinder (valve)
8 wear plate
9 wear ring
10 outlet port

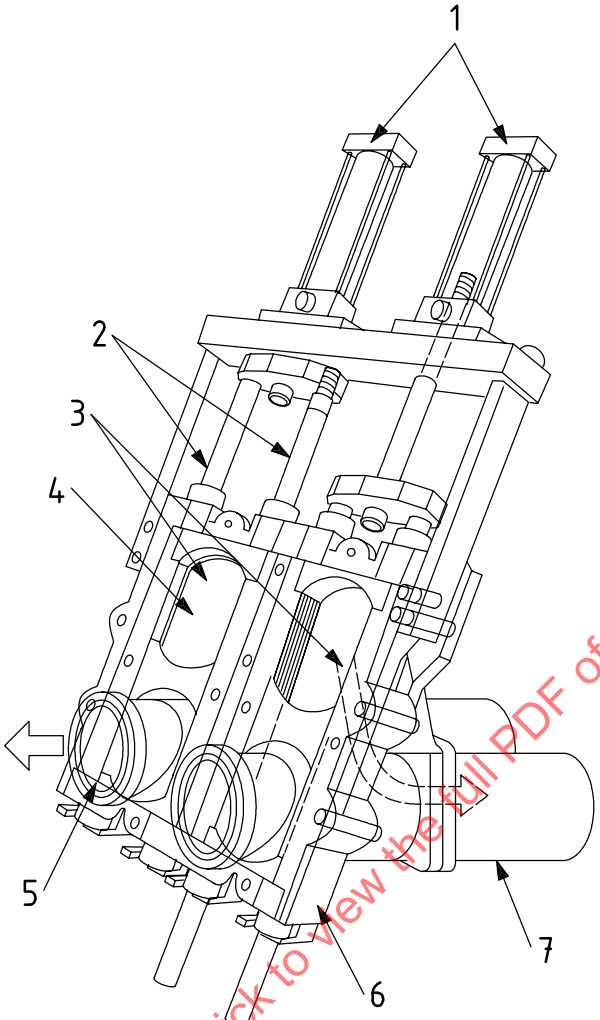
Figure A.1 — Structure of piston-type concrete pump (swing-valve type)



Key

1 concrete cylinder
2 suction port
3 inlet-gate valve
4 hydraulic cylinder
5 casing
6 valve rod
7 hydraulic piston
8 bushing
9 packing (hydraulic cylinder)
10 lubricate bushing
11 packing (gate valve)
12 discharge port
13 outlet-gate valve
14 valve housing
15 stopper

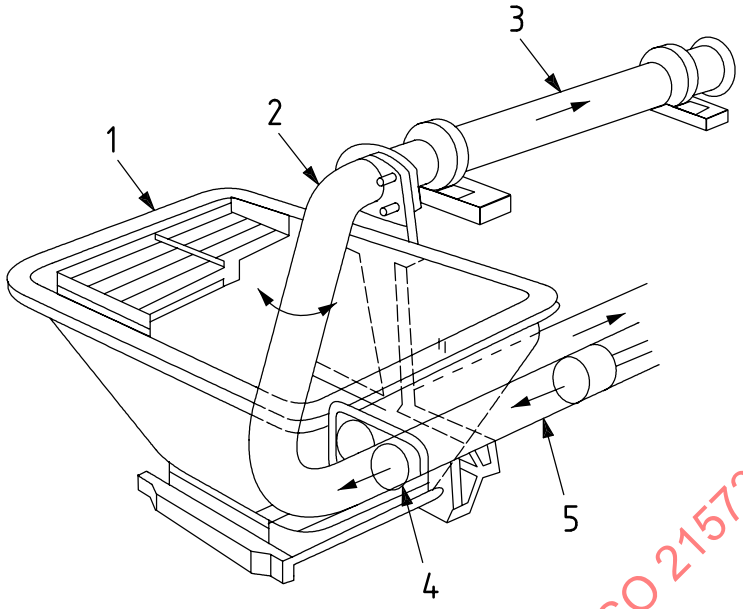
Figure A.2 — Structure and principle of operation of the gate-valve system (horizontal type)



Key

1 hydraulic cylinder
2 valve rod
3 suction port
4 valve plate
5 discharge port
6 valve casing
7 concrete cylinder

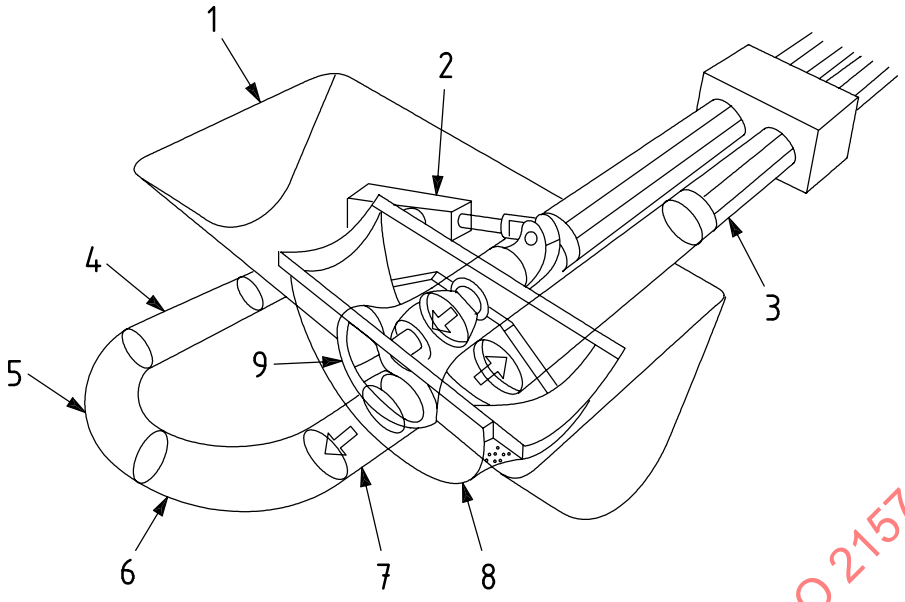
Figure A.3 — Structure and principle of operation of the gate-valve system (vertical type)



Key

1 concrete hopper
2 swing valve
3 outlet pipe
4 intake-outlet port
5 concrete cylinder

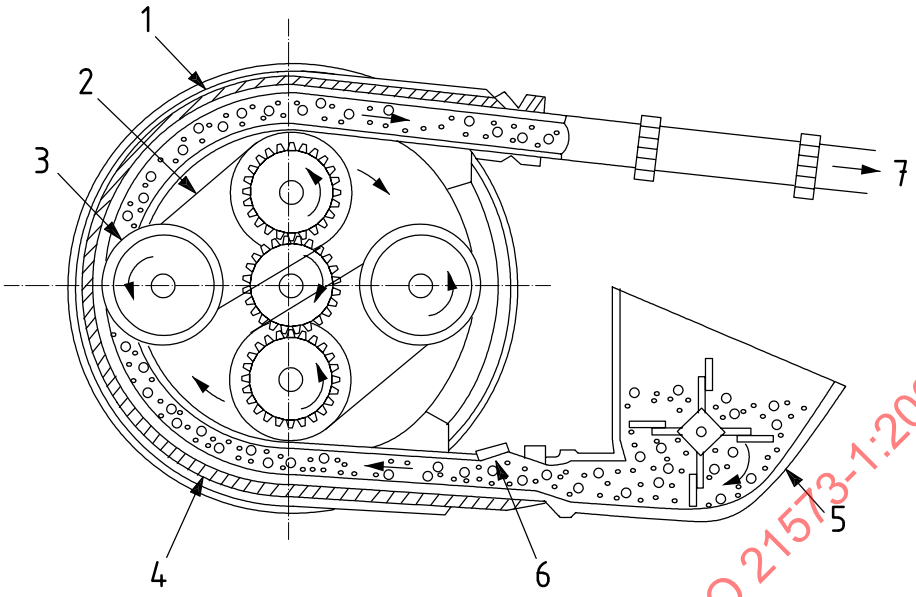
Figure A.4 — Structure and principle of operation of the swing-valve system



Key

1 concrete hopper
2 hydraulic cylinder (valve)
3 concrete cylinder
4 tapered pipe
5 bent pipe
6 tapered bent pipe
7 outlet pipe
8 rock-slicer
9 swing valve

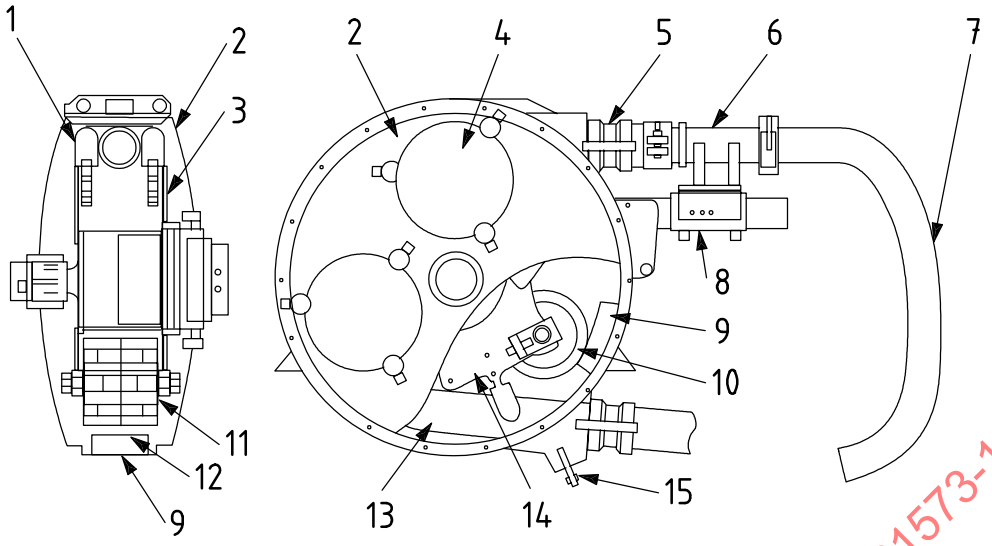
Figure A.5 — Structure and principle of operation of the swing-valve system



Key

1 rubber pad
2 drive chain
3 rubber roller
4 pumping tube
5 concrete hopper
6 suction port
7 discharge port

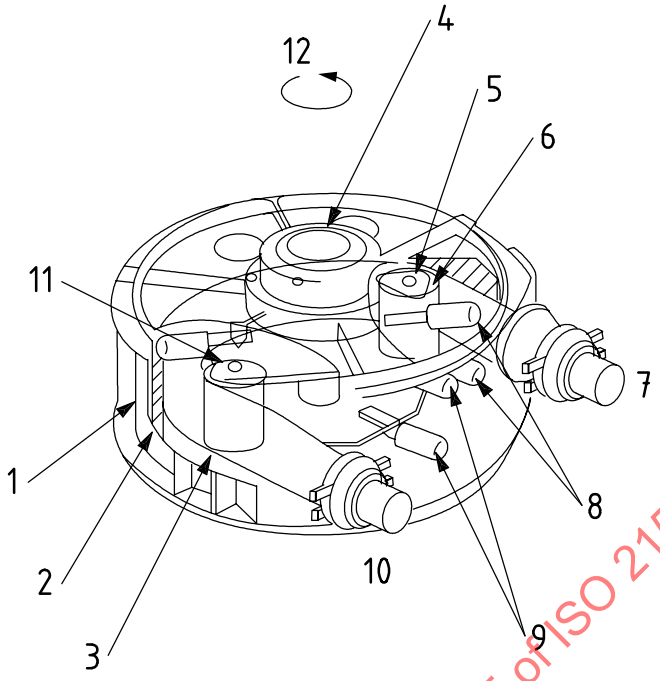
Figure A.6 — Structure and principle of operation of the rotary-type concrete pump



Key

1 guide roller
2 pump casing
3 rotor frame
4 hole cover
5 boots
6 transfer pipe
7 transfer hose
8 support beam
9 rubber pad
10 rubber roller
11 roller shaft
12 roller wheel
13 rubber pad
14 pumping tube
15 rotor
16 drain port

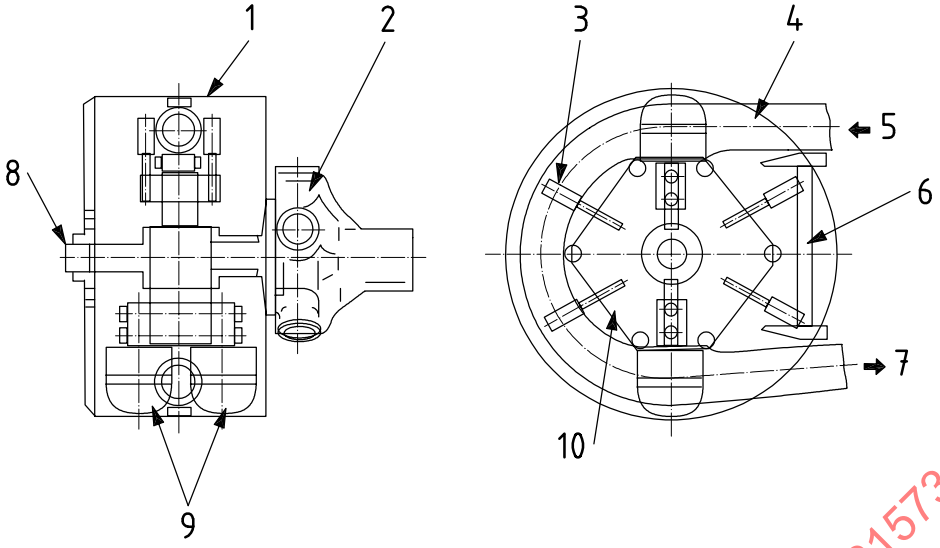
Figure A.7 — Structure of the rotary concrete pump (vacuum type)



Key

1 pump casing
2 rubber pad
3 pumping tube
4 hydraulic motor
5 adjusting screw
6 rubber roller
7 inlet port
8 guide roller (A)
9 guide roller (B)
10 outlet port
11 adjust indicator
12 direction of rotation

Figure A.8 — Structure of the rotary concrete pump (elastic-restore type)



Key

1 pump casing
2 hydraulic motor
3 guide roller
4 pumping tube
5 inlet port
6 tube guide
7 outlet port
8 bearing
9 press roller
10 rotor

Figure A.9 — Structure of the rotary concrete pump with elastic restore (double roller pump)