Feb. 16, 1943. A. BÜCHI 2,311,024

GUIDE APPARATUS FOR CENTRIFUGAL BLOWERS AND PUMPS

Filed May 27, 1941 4 Sheets-Sheet 1

Fig. 1

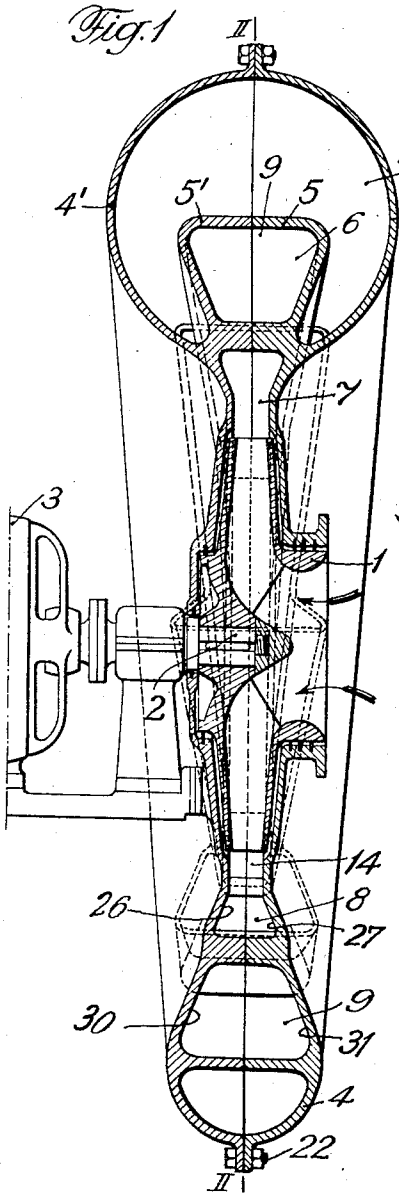
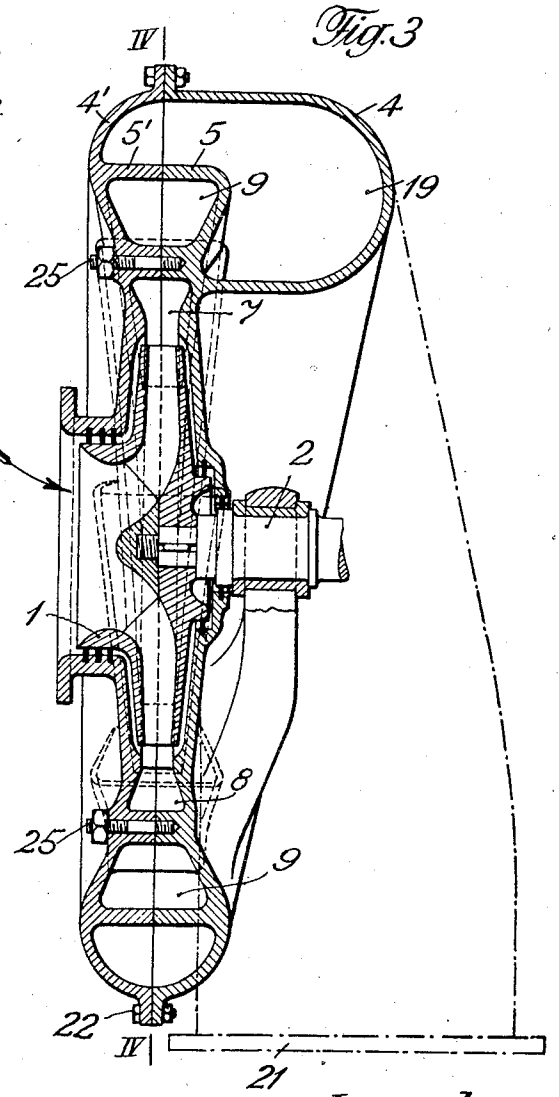



Fig. 3




Inventor,
Alfred Büchi
by Sommers & Young,
Attorneys

Feb. 16, 1943. A. BÜCHI 2,311,024

GUIDE APPARATUS FOR CENTRIFUGAL BLOWERS AND PUMPS

Filed May 27, 1941 4 Sheets-Sheet 2

Fig. 2

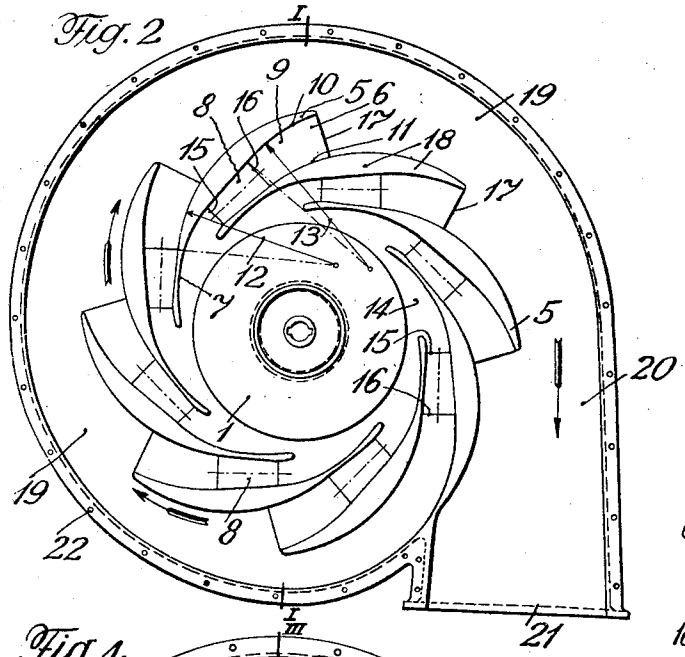



Fig. 4

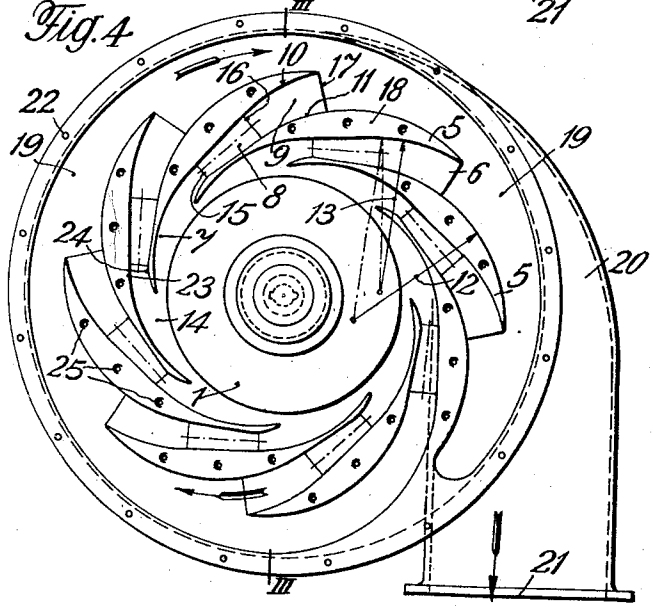
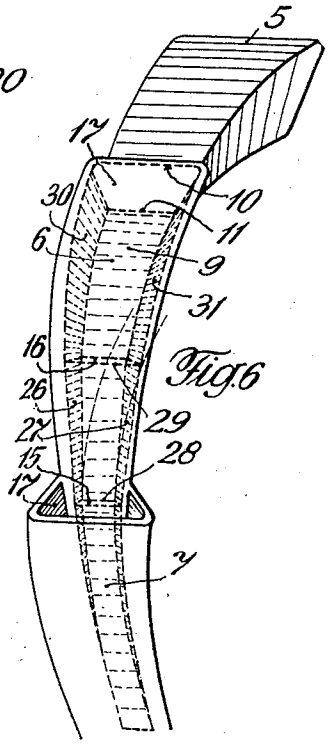



Fig. 6




Inventor;
Alfred Büchi
by Sommers & Young,
Attorneys

Feb. 16, 1943. A. BÜCHI 2,311,024

GUIDE APPARATUS FOR CENTRIFUGAL BLOWERS AND PUMPS

Filed May 27, 1941 4 Sheets-Sheet 3

Fig. 5

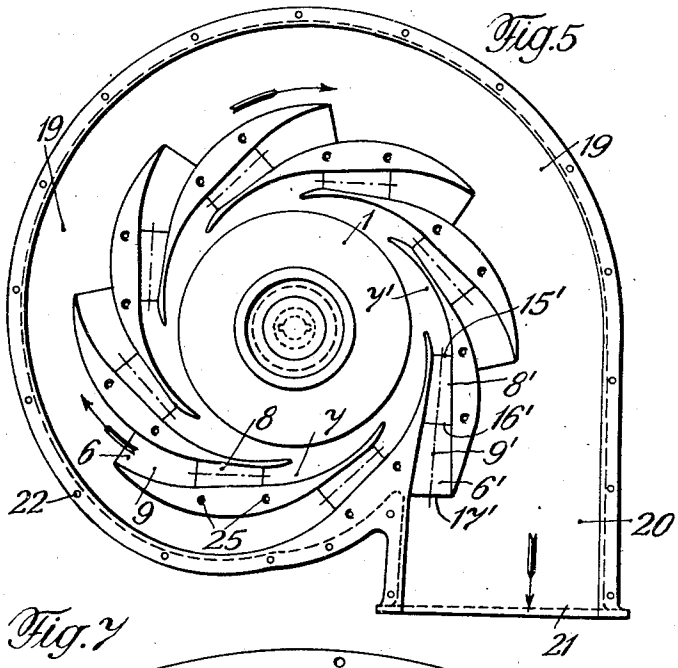
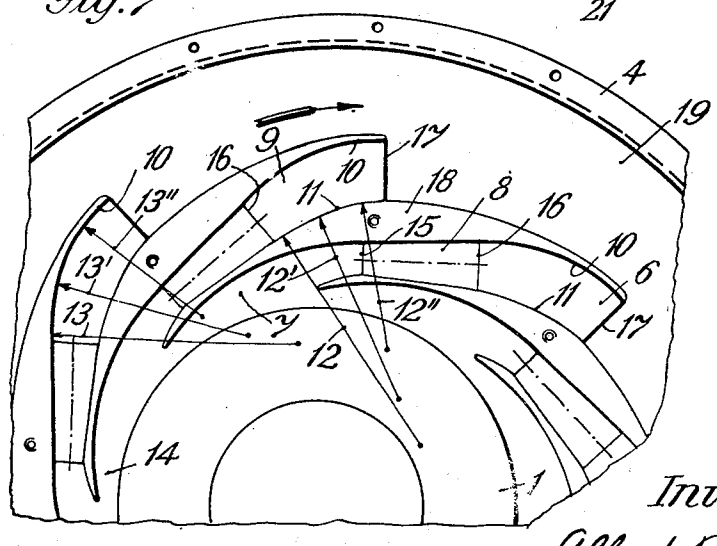



Fig. 7



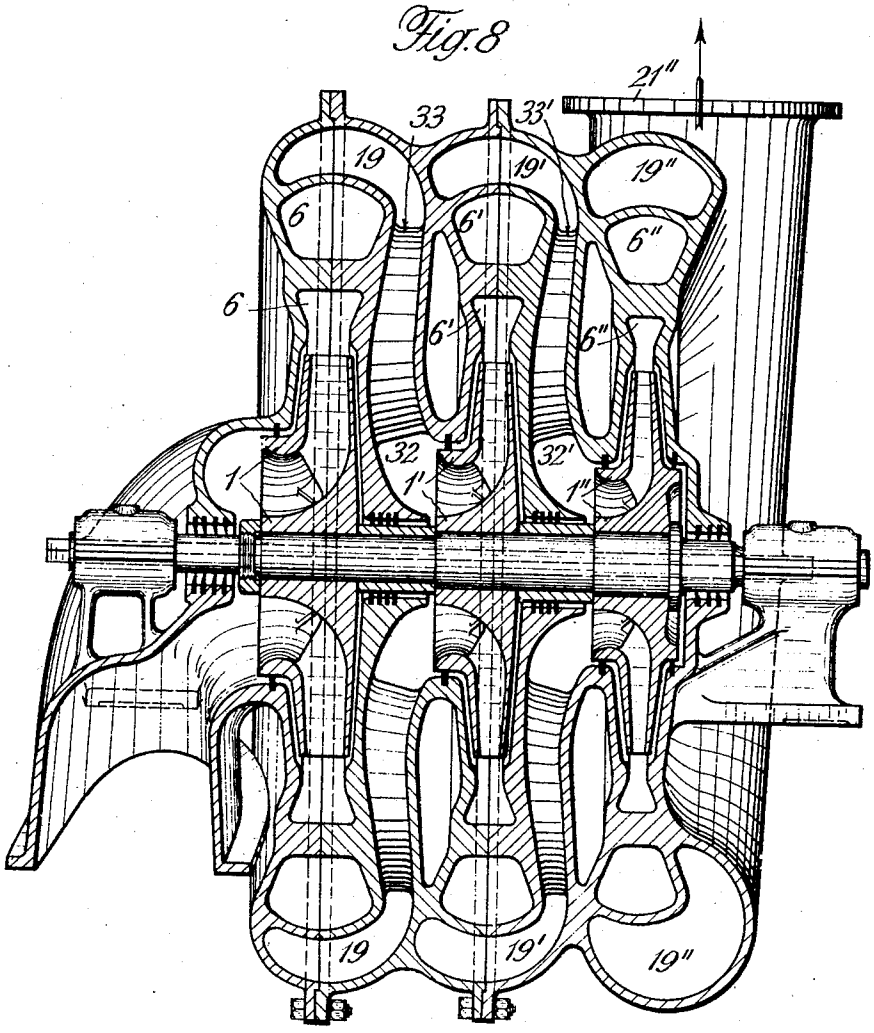

Inventor,
Alfred Büchi
by Sommers & Young,
Attorneys

Feb. 16, 1943. A. BÜCHI 2,311,024

GUIDE APPARATUS FOR CENTRIFUGAL BLOWERS AND PUMPS

Filed May 27, 1941 4 Sheets-Sheet 4

Fig. 8




Inventor,
Alfred Büchi
by Sommers & Young,
Attorneys

Patented Feb. 16, 1943

2,311,024

# UNITED STATES PATENT OFFICE

2,311,024

## GUIDE APPARATUS FOR CENTRIFUGAL BLOWERS AND PUMPS

Alfred Büchi, Winterthur, Switzerland

Application May 27, 1941, Serial No. 395,480
In Switzerland March 8, 1941

20 Claims. (Cl. 103—111)

An object of this invention is to provide guide means for fluids emerging from the rotor of a centrifugal pump which is of such shape and construction as will convert the velocity of the fluid into pressure in the most efficient manner.

A further object of the invention is to provide the guide means with passages having outwardly increasing cone-shaped diffuser portions toward the inner ends thereof, the axes of said portions being straight and the length of said straight conical portions being as great as possible within constructional limitations.

A further object of the invention is to provide the outer portions of the passages of the guide means, outwardly beyond the straight conical portions, with such a shape as will continue the diffuser action in an efficient manner and will guide the fluid into the outer space which receives the fluid in a smooth and efficient manner.

Further objects of the invention are to provide the correct shape of the passages throughout their entire extent and to position the guide means at the most favorable position relative to the impeller.

A still further object of the invention is to make the collector casing of such shape or proportions that the velocity of the fluid at its outlet is less than at its inlet, and to make the discharge areas of the fluid passages of the diffuser of correct size to lead the fluid into the outer part of the collector at the same velocity as at the outlet of the collector.

Other objects and advantages of the invention will be apparent from the following detailed description of some embodiments of the invention which are illustrated in the accompanying drawings.

In the drawings, Figure 1 is an axial sectional view on the line I—I of Fig. 2 of a centrifugal pump or blower having a guide apparatus in accordance with this invention.

Figure 2 is an elevation of one half of the blower of Fig. 1, the separation being on the line II—II of Fig. 1.

Figure 3 is a view similar to Fig. 1 of a modified embodiment of the invention, the section being on the line III—III of Fig. 4.

Figure 4 is a view similar to Fig. 2 of the embodiment represented in Fig. 3, the separation being on the line IV—IV of Fig. 3.

Figure 5 is an elevation of one of the halves of the guide apparatus according to a further modification.

Figure 6 is an axonometric view of the guide channels.

Figure 7 is a fragmentary view of a further modified form of guide apparatus.

Figure 8 is a section through a multi-stage blower or pump.

Corresponding parts in the various figures are identified with the same reference numerals.

Referring to Figs. 1 and 2, 1 designates the rotor of the pump or blower. This rotor can be of any known type and does not form a part of the present invention. The rotor is keyed to the driving shaft 2 which may be driven by an electromotor 3. A closed collector casing 4, 4' surrounds the rotor and contains the guide apparatus 5, 5' according to the invention. This guide apparatus comprises for example eight guide passages 6 successively disposed around the rotor 1. The guide passages are composed of receiving channels 7 to which succeed in the direction of flow of the fluid, first straight guide passage portions 8 widening on all sides, so as to have a gradually increasing sectional area, and then outer guide passage portions 9 having straight lateral walls 30, 31 extending transversely to the driving axis 2 in the same direction as the lateral walls 26, 27 of the passage portions 8, and walls 10 and 11 which are curved in the direction of rotation of the rotor. These curved walls have radii of curvature 12 and 13 which, at the entrance to the passage portions 9, are equal to at least three times the diameter of the guide passage at this place. It is advantageous for obtaining an undisturbed flow in the guide passages that the circles corresponding to the radii of curvature 12 and 13 are tangentially contacting with the walls of the passages. Owing to the particular described shape of the guide passage portions 8 and 9, the partitions or blades 18 intermediate these passages are formed with unusual and irregular shape with respect to guide apparatus of known design, the cross section in the middle portion of these partitions being relatively thick.

The fluid discharged from the rotor 1 is first received in a cylindrical chamber 14 surrounding the rotor and then passes through the receiving channels 7 wherefrom it enters into the straight-walled widening guide passage portions 8. Owing to the gradually increasing sectional area of these portions, the velocity of the fluid at the entrance 15 to the guide passages is transformed with high efficiency into pressure. During the flow of the fluid through the passage portions 9, a reduction of velocity also takes place in these portions owing to their gradually increasing sectional area, and accordingly a fur-

ther increase of pressure is obtained. However, since the passage walls 10 and 11 deflect the fluid in tangential direction, the efficiency of the velocity transformation will not be as high in the passage portions 9 as in the straight portions 8.

In accordance with the present invention the guide passages are designed so that the major portion of the velocity energy is transformed into pressure in the portions 8, while a relatively smaller transformation of energy occurs in the curved passage portions 9. Since the velocity of the fluid is higher in the portions 8 than in the portions 9, and the rate of transformation into pressure is proportional to the difference of the squares of velocity, and supposing that in each of the two passage portions 8 and 9 a transformation of velocity to one half of its value takes place, that is to say when the sectional area at the entrance 15 is one half of the sectional area 16 at the end of the straight passage portion 8, and when the sectional area 16 is one half of the sectional area at the passage outlet 17, then the theoretical production of pressure in the straight portion 8 will be four times higher than in the curved portion 9. For this reason the decrease of the efficiency of transformation in the portions 9 has no great influence on the total efficiency of transformation in the entire passage. The decrease of efficiency in the passage portion 9 can still be reduced when the tangentially guiding walls 10 and 11 are provided, at least in proximity of the straight passage portion 8, with a great radius of curvature as compared with the diameter of the passages, this radius being for example and according to the invention not less than three or four times the diameter of the passage at this place. In order to avoid as much as possible the presence of different pressures along the passage walls 10 and 11 the radii of curvature 12 and 13 at the inner and outer side of the portion 9 are, in accordance with the invention, substantially of equal length. In this case the same effects of twist will be produced at the internal and at the external sides of the curved portion. The width of the channels between the curved walls can be kept equal throughout, or it can be gradually increased in the direction of the flow of the fluid.

The fluid discharging from the guide passages enters into the collecting chamber 19. The sectional area of the outlet 17 of the passages is such that the transformation of velocity in the portion 9 is carried out until the velocity of the fluid entering the chamber 19 is equal to or slightly higher than the velocity of conduction at the outlet 21 of the collector casing. In the latter case the straight portion 20 of the collector outlet in Fig. 2 has a gradually widening sectional area so as to form a diffuser. The different guide passages 6 can be provided, in the direction of rotation and towards the outlet of the collector chamber 19, with successively greater outlet areas 17, for example in such manner that the pressure losses at least, resulting in the chamber 19 between two successive passage outlets 17, are compensated by the higher velocity of the fluid discharging from the preceding passage. It is however possible to make the outlet areas 17 of the passages all of the same size, so that in each passage 6 about the same transformation of velocity takes place and accordingly the reaction of the fluid flowing through the different passages is about the same over the entire circumference of the rotor 1.

In Figs. 1 and 2 the collector casing 4 is integral with the walls of the guide device 5, 5', and the casing 4, 4' and guide device 5, 5' are formed of two halves, the entire apparatus being separated along a median plane extending transversely to the driving axis 2, so that the two portions 4, 5 and 4', 5' are symmetrical with respect to the plane of separation. These two portions are secured together by means of screws 22.

The modification according to Figs. 3 and 4 differs from the previously described example particularly by the fact that the collector casing 4, 4' is unsymmetrical with respect to the transverse median plane passing through the rotor 1. The portion 4 of the casing as seen in Fig. 3 projects much more towards the right side of the median plane than the portion 4' projects towards the left side of this plane. However, the receiving channels 7 and guide passages 8 and 9 are completely symmetrical with respect to the median transverse plane of the rotor 1, in order that no secondary flows are created during the actual velocity transformation which would result in pressure losses. The laterally projecting portion of the casing can be placed on one or the other side of the median plane according to the available space in each specific case.

In this modification, the area of the outlet 21 of the collector casing is not enlarged with respect to the cross sectional area of the casing at 20; the velocity transformation in the guide passage portions 9 is carried out in such manner that the velocity at the passage outlets 17 is reduced to the velocity of conduction at the collector outlet 21. The receiving channels 7 surrounding the rotor 1 are formed with external and internal walls 23 and 24 of such a shape that the fluid entering into the straight passage portions 8 is guided as much as possible in a symmetrical manner with respect to these portions, for example in the direction of the axis of the straight portions 8. In addition to the screws 22 at the outer periphery of the two casing portions 4, 4', the portions 5, 5' of the guide device can be secured to each other by screws 25 traversing the thickened portions 18 of the partitions or guide blades between the passages 6. The sectional areas of flow of the receiving channels 7 and of the guide passage portions 8 and 9 are in Fig. 3 also of trapezoidal shape as in the example of Fig. 1. These sectional areas of flow could also have another shape, such as substantially rectangular, oval or circular.

The sectional areas of flow of the receiving channels 7 could increase towards the entrance of the guide passage portions 8, in such manner that already a transformation of velocity into pressure is taking place in the receiving channels before the fluid enters into the straight guide passage portions. A transformation is also effected already in the cylindrical chamber 14 surrounding the rotor, because this chamber too has an increasing sectional area in the direction of flow.

In the modification according to Fig. 5 the guide passage 6' situated closest to the outlet 21 of the collector chamber 19 is arranged so that the axis of the conically widening passage portion 8' extends substantially parallel to the axis of the discharge tube 20. Instead of curved passage portion 9 with which the remaining passages 6 are provided, the portion 9' is also of straight conical shape and gradually widening on all sides, the angle of opening being the same as that of the passage portion 8'. The gradual increase of

sectional area towards the outlet section 17' has such a rate that the velocity of the fluid leaving the passage 8' is equal to the velocity present in the discharge pipe 20. The cross sectional areas 15' and 16' of the portion 8' are of the same size as the corresponding sectional areas of the other guide passages. This construction offers the advantage that the fluid discharging from this passage must not be carried around the entire circumference of the collector casing in order to reach the collector discharge 20, 21.

Fig. 6 is a view on the external side of the guide device when the outer casing wall is supposed to be broken away. The particular shape of the guide passage can be recognized quite well. The axonometric representation of such a passage shows plainly how the space limited by the receiving channels 7 of trapezoidal shape is widening in the direction of flow of the fluid until the sectional area 15 where the fluid enters into the straight conically widening passage portion 8. The cross section of this passage is also trapezoidal and the outlet section 16 is larger than the inlet section 15. All four sides 26, 27, 28 and 29 diverge along a straight line and in the direction of flow. The four sides are joining each other by rounded corners having a relatively great radius of curvature. At the sectional area 16 the fluid enters into the portions 9 of the guide passages which are curved towards the direction of rotation of the rotor. The lateral walls 30 and 31 of this portion 9 of the passage are also straight and extend in the same direction and with the same angle of enlargement as the lateral walls 26 and 27 of the portion 8, whereas the walls 10 and 11 of the portion 9 are curved relatively to axis of the portion 8, also already described.

As it is seen particularly from Fig. 6, a salient feature of the invention is the arrangement of the guide passages which are widening towards the exterior in the manner of funnels and which overlap each other in the direction of rotation and in transverse direction. The guide passages freely penetrate with their outer ends and laterally into the outer collector chamber. The outlet sectional areas are situated substantially at right angles to the direction of the passing flow. Afterwards the fluid enters into the collector casing and makes contact with the fluid already present in the chamber 19 and flowing at the same speed.

The modification according to Fig. 7 represents guide passages in which the radii of curvature of the curved walls 10 and 11 of the passage portions 9 have different lengths, such as for example indicated by the radii 12, 12', 12'' and 13, 13', 13''. These radii of curvature are chosen so that they are the greatest in proximity of the sectional area 16 and then successively decrease towards the outlet area 17. This arrangement offers the advantage that the direction in which the fluid discharges from the outlet area 17 differs as little as possible from the general direction of flow in the collector chamber 19 and that the external diameter of the collector casing 4 can be made smaller.

Figure 8 shows a three-stage blower or pump in axial section. 1, 1', 1'' are the three rotors or impellers, and 6, 6', 6'' are the guide passages which surround the impellers. 19, 19', 19'' are the corresponding collecting chambers for the fluid escaping from the guide passages 6, 6' and 6''. From the chambers 19 and 19' the fluid will be conducted through radial S-shaped channels 32 and 32', respectively, to the next following impellers 1 and 1', respectively. These channels can be provided with guiding blades 33, 33' which assure a correct leading of the fluid to the following impellers 1' and 1''. The chamber 19, however, is built as a spiral casing with a gradually increasing section up to its exit section 21''.

The guide apparatus according to the invention offers the advantage, that in spite of a favorable arrangement of the guide passage transforming the velocity into pressure, a common collector casing not requiring a too great diameter can be used. The number of guide passages can naturally be other than eight as represented, but investigation has proved that a reduced number of passages between about five to ten, in spite of favorable conditions of flow, requires the smallest collector casing. Owing to separation of the parts 4, 5 and 4', 5' it is moreover possible, to cut off the joining faces more or less on a lathe in order to obtain a proper fitting width of the guide device for a given width of the rotor.

Although I have shown particular embodiments of my improved guide apparatus for rotary blowers and pumps, I do not desire my invention to be limited to the particular arrangements disclosed, and I intend in the appended claims to cover all modifications which do not part from the spirit and scope of my invention.

I claim:

1. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing.

2. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion and having a gradually increasing sectional area in the direction of flow, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing.

3. In a centrifugal blower or pump, the com-

bination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing, said curved inner and outer walls having radii of curvature measuring, at the entrance of the outer guide passage portion, at least three times the length of the guide passage diameter at the said entrance.

4. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing, said curved inner and outer walls having radii of curvature measuring, at the entrance of the outer guide passage portion, at least three times the length of the guide passage diameter at the said entrance, and the width of the outer guide passage portion between said curved walls being equal throughout the length thereof.

5. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing, said curved inner and outer walls having radii of curvature measuring, at the entrance of the outer guide passage portion, at least three times the length of the guide passage diameter at the said entrance, the radii of curvature of said inner and outer curved walls becoming successively shorter in the direction of flow.

6. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing, the radii of curvature of said inner and outer curved walls being equal in order to create within the curved portion of the guide passage substantially the same effect of twist along the inner and outer passage walls.

7. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a cylindrical chamber free from blades extending around the rotor to collect the fluid discharged from the rotor and having a radial width of at least $\frac{1}{30}$ of the diameter of the rotor, receiving channels for directing the fluid from said chamber into the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged from the guide passages, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing.

8. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into said collector casing, the said inner straight walled guide pas-

sage portion being of such a length that the transformation of velocity energy into pressure energy of the fluid entering into the guide passage is effected to a major extent in said inner guide passage portion.

9. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, and a straight diffuser of gradually increasing sectional area formed at the outlet of the collector casing and traversed by the fluid before being discharged from the collector casing, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into said collector casing, the transformation of velocity energy into pressure energy of the fluid entering said guide passages being carried out in said guide passages to reduce the velocity of the fluid at the entrance into the collector casing to a rate being still higher than the rate of velocity at the outlet of the collector casing, the velocity transformation being completed in said diffuser to the rate of the discharge velocity at the outlet of the collector casing.

10. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing, the increase of sectional area between the inlet and the outlet of said guide passages being such that the transformation of velocity energy into pressure energy of the fluid traversing said guide passages is carried out in the guide passages to reduce the rate of velocity of the fluid leaving the guide passages to the rate of discharge velocity at the outlet of the collector casing.

11. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing, the different outer curved guide passage portions having outlets of successively increasing sectional areas towards the outlet of said collector casing, and the rate of velocity at the passage outlets, considered in the direction of flow in the collector casing, successively decreasing in such manner that the pressure losses resulting in the collector casing between successive passage outlets are at least compensated by the velocity heads existing between such successive outlets.

12. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, an outer collector casing common to all guide passages for receiving the fluid discharged therefrom and provided with a discharge opening for the collected fluid, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing, and a guide passage delivering fluid into the collector casing in proximity of the discharge opening of said casing and extending substantially parallel to the axis of said opening, said guide passage widening with all sides according to a straight line and having a successively increasing sectional area whereby the velocity of the fluid delivered into the collector casing is equal to the velocity at the discharge opening of the collector casing.

13. In a centrifugal blower or pump, the combination of a rotor, having a discharge end, fluid guide apparatus surrounding said discharge end and forming a chamber for receiving the pressure fluid discharged from said rotor, said guide apparatus having a plurality of straight walled outwardly flaring passages for unidirectionally guiding the fluid through said apparatus, and a casing located outwardly of said guide apparatus forming an annular chamber for collecting said fluid from the outer portions of said passages, said casing being eccentric with respect to the medial plane of the rotor and guide apparatus, said casing having an outlet at one end and merging with its other end with the larger end of one of said straight walled guide passages adjacent said casing outlet, said guide apparatus being sectioned in two equal halves along a plane extending transversely to the axis of said rotor and medially through said rotor and said guide apparatus but eccentrically to said annular chamber with respect to the axial direction of said ro-

tor, said annular chamber being situated laterally of said rotor discharge area and the cross sectional area of said chamber gradually increasing in the direction of flow of fluid commensurate with the quantity of fluid supplied through the guide passages.

14. In a centrifugal blower or pump, the combination of a rotor, fluid guide apparatus surrounding said rotor and providing a chamber for receiving the pressure fluid discharged from said rotor, said guide apparatus having a plurality of continuously outwardly flared straight walled guide passages for unidirectionally guiding fluid therethrough, and a casing located outwardly of the guide passages for collecting said fluid from the outer portions of said passages, said casing having an outlet at one end and merging at its other end with the larger end of one of said straight walled outwardly flared guide passages adjacent said outlet, said guide apparatus being sectioned along a plane extending transversely to the axis of said rotor for exposing the walls of the fluid guide apparatus to access for being faced true to the required form.

15. In a centrifugal blower or pump, the combination of a single-acting rotor, guide apparatus surrounding said rotor and providing a cylindrical chamber for receiving pressure fluid discharged from said rotor, said guide apparatus having a plurality of straight walled outwardly flaring passages therethrough, and a casing located outwardly of said guide apparatus for collecting the fluid from the outer portions of said passages, said casing having an outlet at one end and merging with its other end with the larger end of one of said straight walled guide passages adjacent said outlet, said guide apparatus being sectioned in two equal halves along a plane extending transversely to the axis of said rotor and medially through said rotor, said apparatus and said casing, each half forming a single piece comprising a section of each of said fluid guide apparatus, said sections being truly symmetrical thereby concurrently unidirectionally delivering said fluid from said receiving chamber into said collector casing in a balanced flow relative to said plane.

16. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion having straight axes and the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing, partitions between successive guide passages, said partitions having thickened portions of substantial width owing to the shape of the guide passages, said guide apparatus being separated in two halves along a plane extending transversely to the axis of the rotor, and connecting means passing through the thickened portions of said partitions for securing the two halves to one another.

17. A centrifugal blower or pump as defined in claim 1, wherein the section of flow of said guide passages and said receiving channels is of trapezoidal shape.

18. A centrifugal blower or pump as defined in claim 1, wherein said receiving channels extend in such manner with respect to said guide passages that the flow of fluid from the receiving channels into the inner portion of the guide passages is symmetrical with respect to the axis of said inner portion.

19. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing, said outer curved passage portions having discharge sections extending substantially at right angles with respect to the direction of flow across thereof.

20. In a centrifugal blower or pump, the combination with a rotor, of guide apparatus surrounding the rotor, said guide apparatus including a plurality of guide passages, a plurality of receiving channels for directing the fluid discharged by the rotor to the guide passages, and an outer collector casing common to all guide passages for receiving the fluid discharged therefrom, each of said guide passages being composed of an inner straight walled funnel-shaped portion the cross sectional area of which gradually increases in the direction of flow, and of an outer portion joining said inner portion, said outer portion having lateral straight walls extending transversely to the axis of the rotor and in the same direction as the corresponding straight walls of the inner portion, and inner and outer walls curved toward the direction of rotation of the rotor to direct the fluid from the outer guide passage portion into the said collector casing, said receiving channels having walls extending relatively to said inner guide passage portions so as to direct the fluid in a parallel flow according to the axis of said portions into the same.

ALFRED BÜCHI.