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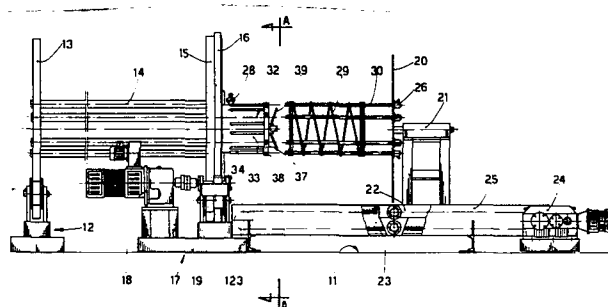
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(54) Machine to form cages.

(57) A forming machine suitable to realize cages for reinforcement with at least one iron bar circumferentially disposed according to a desired spiral, the machine consisting of a drive flange (15) and a free-turning flange (20) supported on a trolley (22) which can move in front of the drive flange (15), both flanges having a plurality of holes (14—214) disposed in concentric circles for positioning the longitudinal rods (30), the machine comprising in combination a substantially conical forming element (32) extending in front of said drive flange (15) and anchored thereto towards the free-turning flange (20), it having fixed thereon a plurality of peripherically spaced spacer means (34), whereby the forming element (32) bears positionable flange means (37) carrying rollers (38) which cooperate in preventing torsion, said flange means (37) being provided with own locking means (39).



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1 Description of the invention entitled:

MACHINE TO FORM CAGES

in the name of REMA - Macchine Utensili Spa at San Giorgio di
Nogaro

5 Submitted on

under no.

The subject of the invention is a machine to form cages for
building purposes; to be more specific, the subject of this
invention is a machine suitable for forming and conforming
10 cylindrical cages and cages with a polygonal section and in
particular, but not only, cages for conduits, foundation piles,
comlumnns or the like substantially without torsional deformation.
Hereinafter the word "cage" will also be used to mean any
type of reinforcement for concrete products.

15 The cage which can be made with the machine of the invention
comprise a plurality of iron bars with the section and charac-
teristics desired, arranged axially according to a configuration
which is advantageously circular.

Around these longitudinal bars at least one wire is envisaged.
20 as being arranged in a spiral and located circumferentially
in respect of said longitudinal bars.

Many type of machines are known which form cages.

Machines to form cages are known which comprise rotating wheels
that bear periferically and rigidly the lengthwise round bars
25 being formed.

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1 In this type of machines the spiral is formed with a wire fed
by an unwinding device which moves along the cage either
outside or inside said cage in rotation.

Another type of forming machine is known which comprises one
5 single flange able to support vertically the lengthwise bars
of the cage.

Said flange can rotate or be stationary.

If said flange is stationary, a device is envisaged which
unwinds the coiled wire and is able to rotate around said
10 cage along a spiral path.

Other known systems envisage that said unwinding device is
capable of a simple rotation, drawing the cage lengthwise in
one direction or the other.

The prior art as documented by EPO Search RS 62986 IT, also
15 teaches that another type of machines for the production
of reinforcement cages which comprise longitudinal rods and
an armament wire wound about the longitudinal rods generally
consists of two synchronously driven disk flanges for holding
and guiding the longitudinal rods; one of the flanges being
20 longitudinally displaceable and supports the ends of the
longitudinal rods. The other flange is immovable and axially
guides the longitudinal rods.

Guide means for the longitudinal rods are usually provided
on the immovable flange, the radial position of said guide
25 means being generally adjustable either manually to suit the
radial size of each cage being formed by providing a plurality
of positioning bores in concentric circles in the immovable
flange or automatically by means capable of varying the radial
position of said guide means both during the formation of the
30 cage or for each different cage size.

The armament spiral wire is usually spot-welded to the longi-
tudinal rods at each point of contact therebetween.

The welding is done while the cage is in rotation either

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1. manually or automatically, the longitudinal rods being sus-
tained only at the points of their engagement with the rotating
flanges.

It is known that in order to spot-weld the spiral wire to the
5. longitudinal rods it is necessary to create a proper contact
points between said spiral wire and the longitudinal rods which
requires a tight wrapping of the spiral wire about the rotating
longitudinal rods.

Due to the tangential pull of the spiral wire this tight
10. wrapping causes torsional deformation of the cage since the
longitudinal rods are not sustained peripherically at the
welding section which is downstream of the immovable flange.
In order to minimize this torsional deformation it has been
hitherto necessary to confine the rotational speed of the
15. cage within a limited range.

This torsional deformation is accentuated as the cage formation
proceeds and the cage length develops.

In addition to the above-mentioned torsional deformation, the
tightening of the spiral wire disadvantageously produces cages
20. of polygonal circumference only due to the fact that the wire
portions lying between one longitudinal rod and the next are
substantially straightened by the tension induced therein.

This problem has been partially solved in the past by increas-
ing the number of long rods which results in unduly heavy
and uneconomic cages.
25.

The object of the invention is a machine to form reinforcement
cages including means capable of giving sufficient circum-
ferential support to the cage in formation which eliminates
the torsional deformation.

30. One further object of the invention is to provide means suit-
able for forming circular reinforcement cages without having
to unnecessarily augment the number of the longitudinal rods
as well as cages with polygonal sections if and when requested

1. It is a derived advantage of the present invention to form
cages at speeds higher than speeds hitherto obtained hence
an enhanced productivity.

Another advantage of the present invention is the production
5 of circular or polygonal cages with the right number of longi-
tudinal rods for the requested strength, saving thus on weight.

The subject matter of the invention is a machine to form
cages comprising two flanges having holes which are and can
be pre-set to position and support the plurality of container
10 tubes needed to hold the longitudinal rods, one of said flanges
being a drive flange, while the other driven, both positioned
essentially on the same axis and connected together by the
longitudinal rods themselves, the free-turning driven flange
being in front of the drive flange and supported and upheld
15 by a trolley that moves in front of said drive flange and
comprises the same number and of positioning holes as the
other flange and moves substantially along the same generatrix.

According to the present invention a forming element is envis-
aged between the drive flange and the free-turning flange
20 and is solidly fixed to the drive flange.

Said forming element is dimensioned in relation to the cage
diameter and thus, if the radial position of the container
tubes is varied, it is necessary to vary the forming element
as well.

25 The forming element has the shape of a truncated cone with
its larger end anchored to the drive flange.

To ensure that the circumference of the cage being formed
is as round as possible the forming element comprises some
fixed bars, or bars which can be fixed, separated by the
30 longitudinal rods of the cage and having a diameter or thick-
ness substantially the same as that of the longitudinal rods.

These fixed bars or bars which can be fixed are needed when
it is wished to obtain cylindrical cages; but can be removed.

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1. when it is wished to obtain polygonal cages.

. The said fixed bars or bars are wholly or partially removable.

. In front of the forming element a positionable internal flange

. is envisaged to bear peripherically positioned rollers coop-

5 erating with the longitudinal rods; said flange serves to

. ensure that the cage does not undergo torsion.

. To be specific, this flange by means of one single operation

. enables all the rollers cooperating laterally with the longi

. tudinal rods to be positioned and then to be clamped in the

10 desired position, the purpose being to prevent the cage being

. processed from having its longitudinal rods askew in respect

. of its own axis of symmetry, a thing which would happen

. otherwise because of the torsion generated by the spiral

. wire during its winding and welding on the bundle of longi-

15 tudinal rods at the portion of the cage downstream of the

. drive flange.

. At the side of the drive flange is envisaged a straightening

. group which feeds substantially continuously the wire which will

. be positioned circumferentially around the cage, in a position

20 very near the base of the forming element, said base being

. substantially cylindrical according to one realization of the

. invention.

. The invention, therefore, is realized in a cage-forming machine

. suitable for forming cages for reinforcement with at least

25 one circumferential wire disposed according to a desired

. spiral, whereby the machine consists of a drive flange and a

. free-turning driven flange borne on a trolley which can move

. in front of the drive flange, both flanges having a plurality

. of holes disposed in concentric circles for positioning the

30 longitudinal rods, said machine being characterized by includ

. ing in combination

. - a substantially conical forming element stretching in front

. of said drive flange and anchored thereon towards the free

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1. turning flange, having fixed thereon a plurality of peripherically spaced spacer means;
- whereby the forming element is equipped with positionable internal flange means bearing free-turning guide rollers
5. to provide resistance to torsion, said rollers being disposed circumferentially in respect of said flange means and cooperating with said longitudinal rods.

With the help of the attached tables, which have been provided as non-restrictive examples, let us now describe the machine according to the invention.

In the tables we have as follows:

- Fig. 1 gives a side view;
- Fig. 2 gives a front view along AA of Fig. 1;
- Fig. 3 shows a possible perforation of the flanges;
15. Fig. 4 shows a variant of the flanges of Fig. 3;
- Fig. 5 shows a lengthwise section of the forming element;
- Fig. 6 shows a frontal view of the forming element according.

With reference to the figures we have the following: 10 is, in general, the cage-forming machine and can have one single base of a plurality of separate bases; 11 is the carrying surface or floor; 12 is the rear group for supporting the free-turning wheels; 13 is the driven flange supported by the support group 12; 14 are the longitudinal rods tubes and have a desired length, being anchored to the flanges 13 and 15 or merely inserted thereinto whenever a rigid connecting shaft is envisaged between the flange 13 and the drive flange 15; 16 is the toothed wheel or other means for receiving motion and is solidly connected on one side to the drive flange 15 and is connected on its other side (besides teeth, it could also be connected by means of belts, ropes, chains, etc.) to the primary drive group 17, which comprises the motor group 18 and the transmission and support group 19 which activates the wheel 16 directly; 20 is the free-turning flange positioned

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1. in front of the drive flange 15; 21 is the support anchored .
to the trolley 22 and bears the free-turning flange 20; said
trolley 22 is enable to move in front of the drive flange
15 according to a desired programme so that the free-turning
5. flange 20 moves substantially on the same axis as said flange
15; 23 is the drive chain causing lengthwise movement of the
trolley 22 and travels backwards and forwards to the wheels
123, being activated in our example by the secondary drive
group 24, which conditions is a desired manner the movement
10. of the trolley 22; the group 24, can also be embodied in the
primary drive group 17; both the primary group 18 and the
secondary group 24 can be operated by hand, that is to say,
they can comprise a gear-box which can be operated by hand
with a control lever or they can be operated automatically
15. or semi-automatically; both these groups have one forward
gear, one neutral and one reverse gear; 25 are the runways
of the trolley 22 and extend in front of and below the wheel
15; 26 are the clamps which serve to fix ~~the~~ longitudinal
rods 30 to the free-turning wheel 20; 27 are the free-turning
20. wheels which support the transmission group 19 and serve to
sustain the drive wheel 15; 28 is the straightening device
and can be one or more in number in relation to the number
of circumferential wires 29 employed; 29 are the circumferential
wire and 129 is the portion being fed, while 30 are the longi
25. tudinal rods and 31 is the direction of rotation; 32 is
generically the forming element and has a substantially conical
shape, with its larger end positioned substantially in contact
with the drive flange 15, to which it is anchored, whereas
33 is the bell element of the forming element 32; 34 are
30. spacer means which are or can be fixed as required and which
cooperate with the longitudinal rods 30 to obtain a harmonious
development of the circumferential wires 29 so as to ensure .

that the rods do not become polygonal where it is not

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1. required to be such; the forming element 32 can have its
initial tract, near the drive flange 15, substantially
cylindrical, its successive tract being substantially tapered;
35 is a terminally threaded supporting shaft anchored to the
5 bell element 33; 37 is the positionable flange and is supported
and axially guided by the supporting shaft 35 and bears the
free-turning rollers 38 which cooperate with the longitudinal
rods 30; said rollers 38 are envisaged advantageously as being
the same in number as the longitudinal rods 30 and lie pos-
10 itioned at an angle like said bars 30; 39 is the clamping
handwheel with an internally threaded portion which cooperates
with the threaded end of the supporting shaft 35 and thrusts
the flange 37 towards the bell element until said flange 37
or the pins or other means protruding from said flange 37
15 bear, in our example, against the front edge of the bell
element 33 and, being pressed thereagainst, are fixed in the
desired circumferential position.
To prevent complete removal of flange 37 from support shaft
35, an eventual pin 36 may be inserted through the support
20 shaft 35 and a hub portion of flange 37, the diagonal bore
drilled in said hub portion being greater than the diameter
of pin 36 to allow a limited relative radial and axial move-
ment between flange 37 and its support shaft 35 before the
clamping action is carried out.
25 With reference to Fig. 3, the rear flange 13 comprises a
plurality of holes 214 pre-arranged symmetrically around the
axis of said flange 13 in a suitable number and size, said
holes 214 being suitable for lodging the ends of the container
tubes 14 according to the requirements and shape of the cage.
30 desired.
Fig. 4 shows a variant of said rear flange 13, wherein a
plurality of radial slots 314 is envisaged to be arranged
symmetrically around the axis of said flange 13.

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1. Within said slots 314 are envisaged adjustable spacer means
315 able to regulate the diameter of the cage by displacing
the container tubes 14 radially; said spacer means 315 also
serve to clamp said container tubes 14 in the radial position
5 required.

The aforesaid spacer means 315 consist of an anchorage head
316 equipped with a threaded shank 317 that cooperates with
an internally threaded hexagonal tube 318, of which the inner
end cooperates with a second threaded shank 319 anchored or
10 welded to the relative container tube 14 in such a way that,
by revolving said hexagonal tube 318 with a suitable key,
it is possible to regulate the radial depth of the relative
container tube in respect of the axis of the flange and
thereby the diameter of the cage.

15 First of all, the container tubes 14 are positioned and the
longitudinal rods 30 are then inserted into them.
Said longitudinal rods 30 are then fixed with clamps 26 to
the free-turning flange 20, which is brought for this purpose
to its nearest position to the drive flange 15.

20 Next the rollers 38 are positioned, being solidly fixed to
the positionable flange 37 but able to turn freely; positioning
of the rollers 38 is done in cooperation with the position
of the longitudinal rods 30.

Steps are then taken to move the spiral wire 29 forward until
25 it is near to a longitudinal rod 30 to which it can be welded.
At this stage the machine can work either automatically with
continuous rotation, or according to a rhythm with the trolley
22 being moved as desired, or else semi-automatically or else
by hand operation.

30 The presence of the rollers 38 has the effect that sideways
movement of the metal rods 30 does not take place, since
otherwise such a movement would lead to torsion in the cage
being formed.

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1. As we said, the trolley 22 and therefore the free-turning
flange 20 can go backwards as desired and can also halt for
a period or for a required number of revolutions (of the
drive flange 15).

5 The outcome of this is that the circumferential wire 29 is
coiled in a spiral as desired with coils of a different pitch
to suit the requirement.

According to the invention, the resulting cage will have the
circumferential wire 29 over almost all its length, with only
10 its initial part remaining free.

This is very advantageous where said cage has to cooperate
with other cages in line or at an angle or normal to the cage
formed.

We have described the invention here according to a preferential
15 solution, but variants can be applied; thus the proportions
and sizes can be varied; parts can be added or removed or to
be integrated or replaced, etc. These and other variants are
all possible for a technician in this field.

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CLAIMS

- 1 - Machine to form cages, being suitable for forming cages for reinforcement with at least one wire disposed circumferentially according to a desired spiral, whereby the machine consists of a drive flange and a free-turning flange supported by a trolley which can move in front of the drive flange, both flanges having a plurality of holes (14-214) disposed in concentric circles for positioning the longitudinal rods (30), said machine being characterized by including in combination
- a substantially conical forming elements (32) extending in front of said drive flange (15) and anchored thereto towards the free-turning flange (20), having fixed thereon a plurality of peripherically spaced spacer means (34);
- whereby the forming element (32) bears positionable internal flange means (37) carrying rollers (38) which cooperate in preventing torsion.
- 2 - Machine to form cages as in claim 1, characterized by the fact that the spacer means (34) comprises a plurality bars positioned lengthwise and substantially parallel to the lengthwise iron rods (30), whereby the presence of said spacer bars (34) is proper for making cylindrical cages, said spacer means (34) being advantageously of a removable type.
- 3 - Machine to form cages as in claim 1, characterized by the fact that the forming element (32) comprises a substantially cylindrical tract near the drive flange (15).
- 4 - Machine to form cages as in claim 1, characterized by the fact that the forming element (32) has a tapered conformation of its bell (33), of which the smaller end lies towards the free-turning flange (20), whereby a positionable internal flange (37) peripherically bearing thrust rollers (38) is located in front of the forming element (32).
- 5 - Machine to form cages as in claims 1 and 4, characterized

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1. by the fact that said internal flange (37) is coaxially
mounted on and axially guided by a central support shaft
(35) axially extending from said forming element (32).

6 - Machine to form cages as in claims 1 and 5, characterized
5. by the fact that said internal flange (37) is provided with.
means to lock said internal flange (37) against said forming
element (32).

7 - Machine to form cages as in claim 6 characterized by the
fact that said locking means consists of a coaxial handwheel
10. (39) having an internally threaded hub cooperating with a
terminal threaded portion of the said support shaft (35).

8 - Machine to form cages as in claim 1 and in one or another
of the claims thereafter, as described and shown and for the
purpose allowed.

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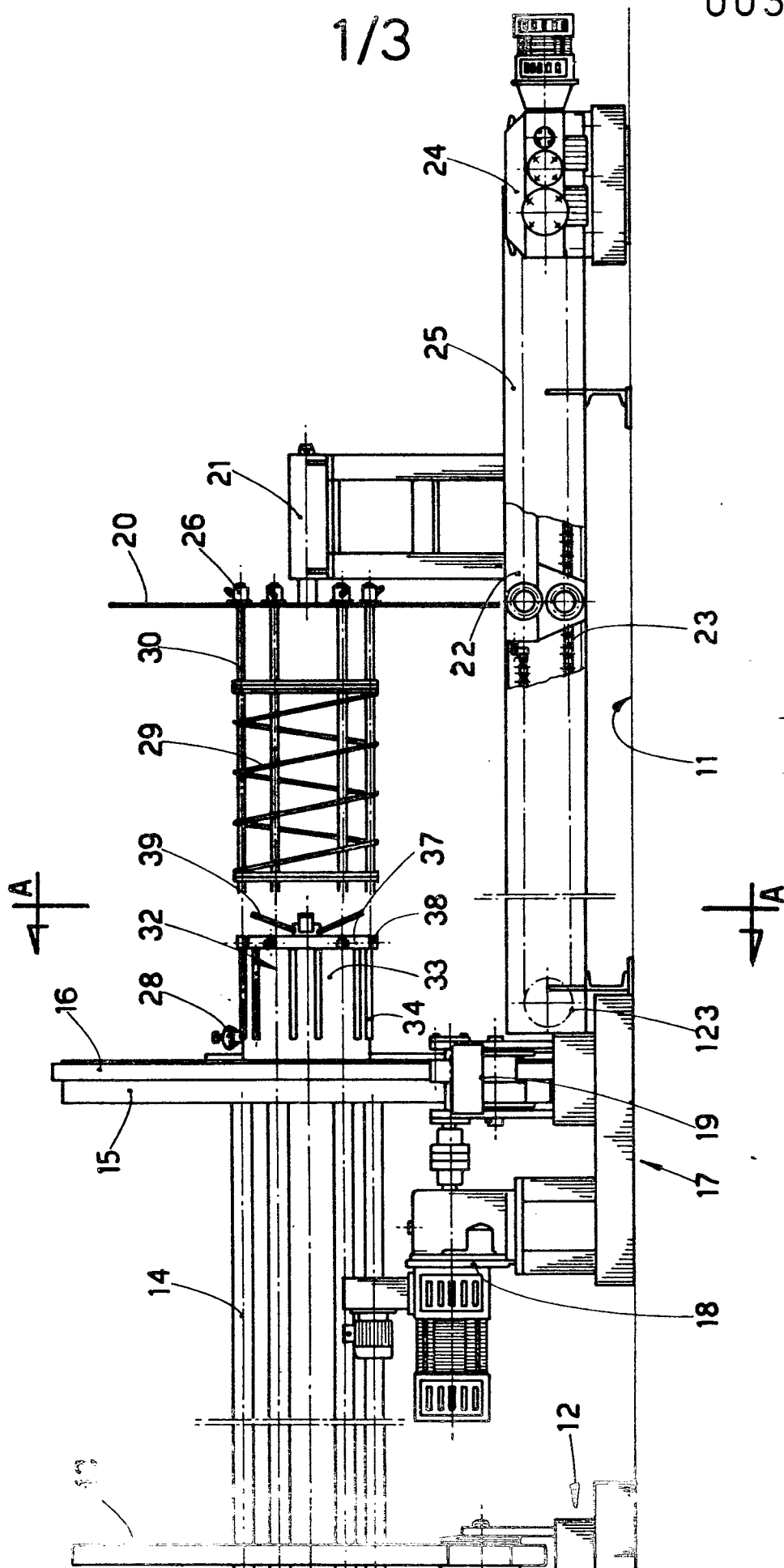


fig.1

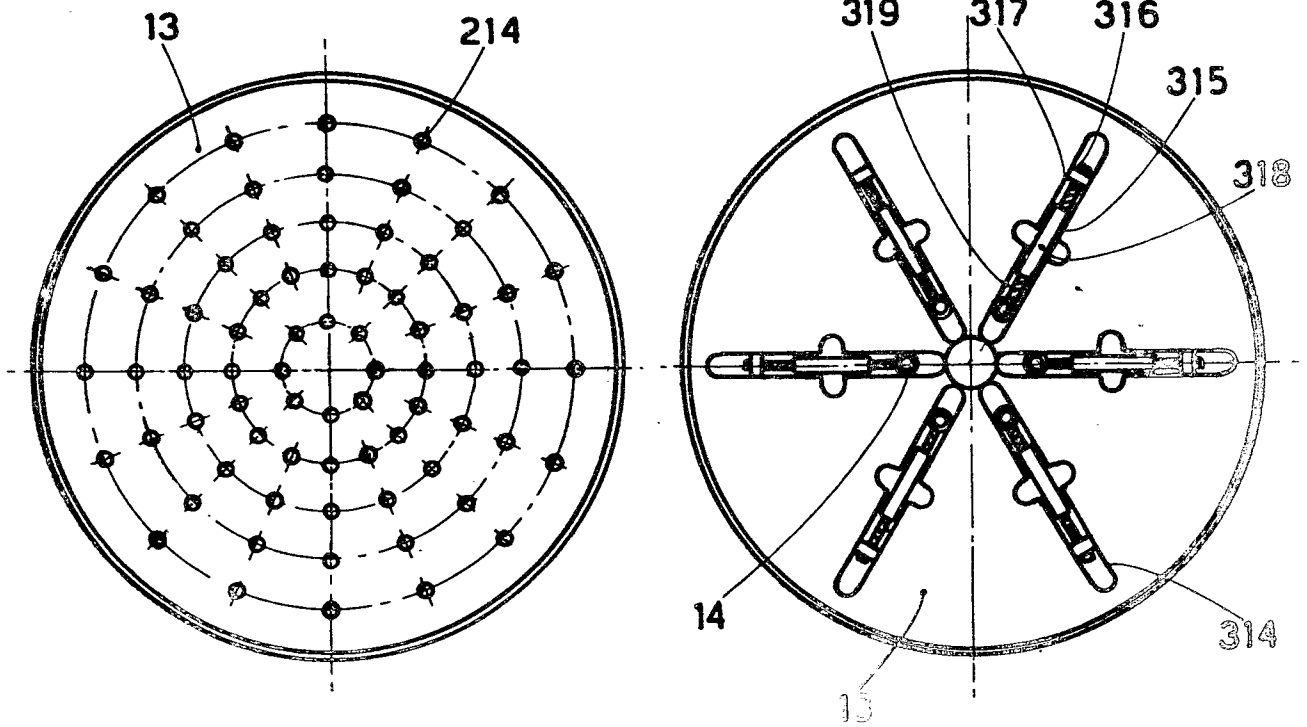
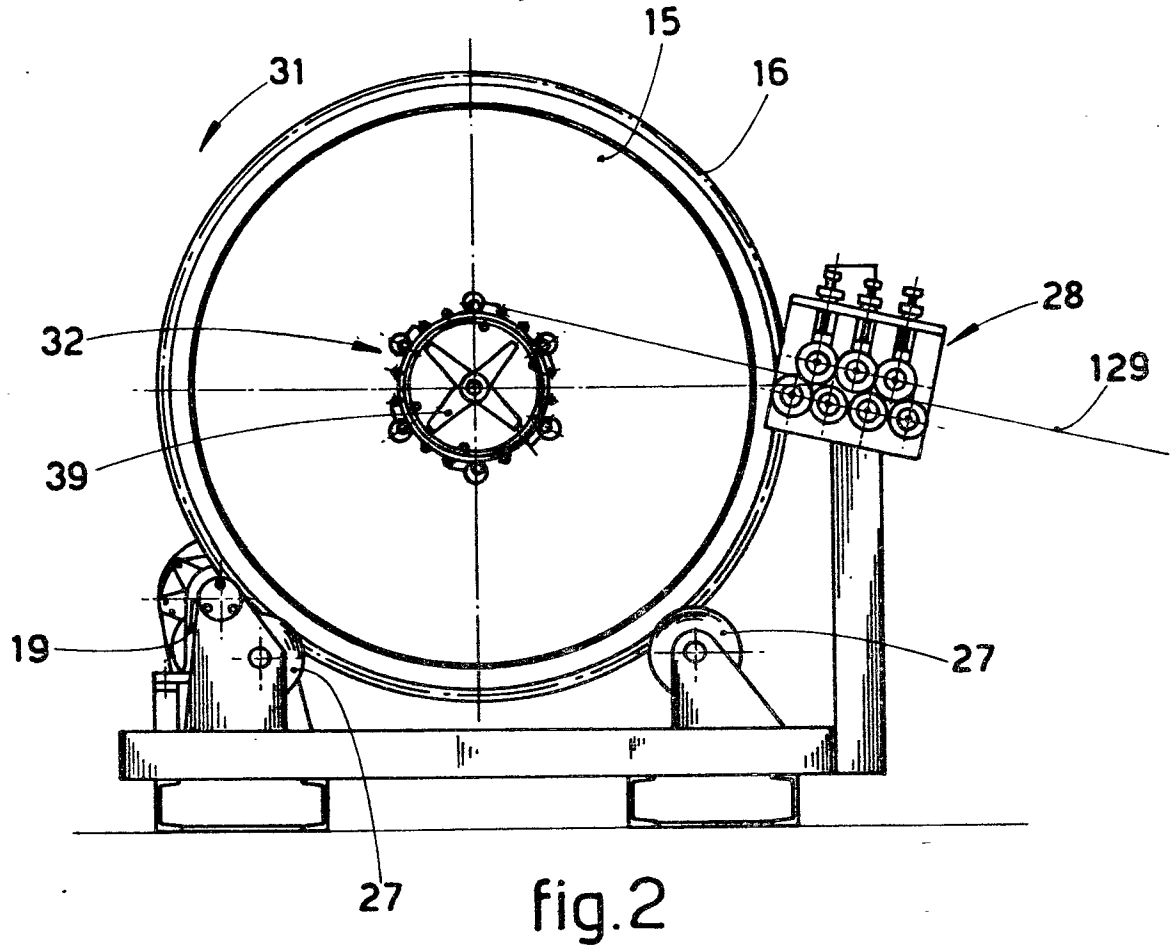
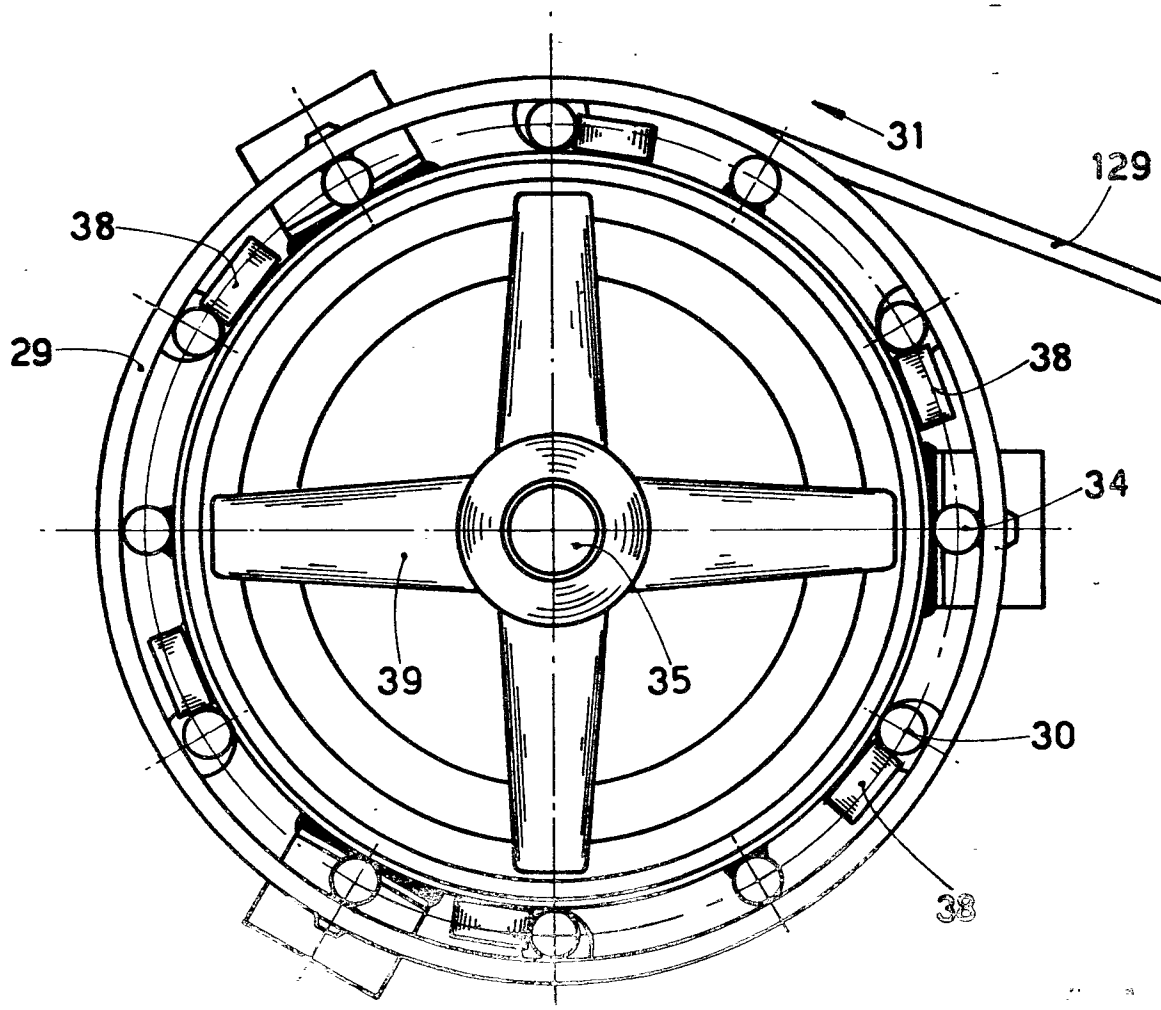
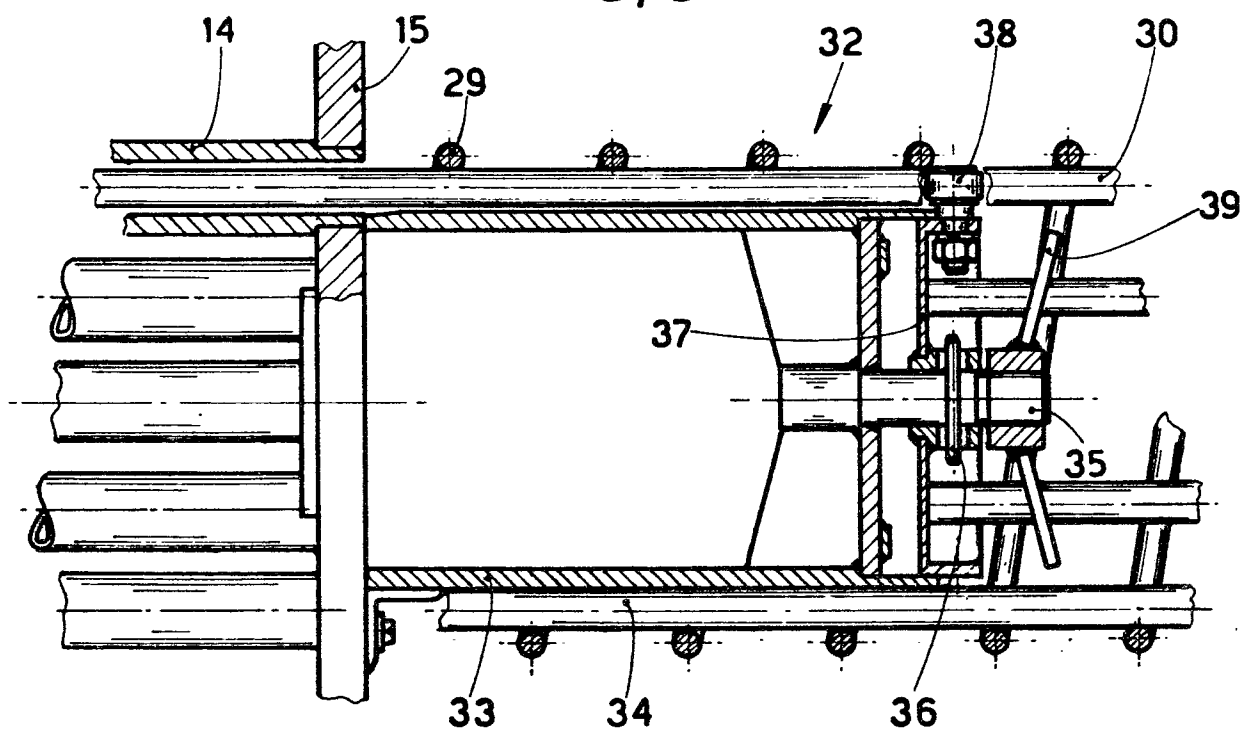


fig. 3

fig. 4





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EUROPEAN SEARCH REPORT

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Application number
EP 81 83 0031

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	GB - A - 525 485 (WELLINGTON CONCRETE PIPE COMP.) * The whole document * ---	1	B 21 F 27/20
A	DE - C - 918 504 (WOLFER)		
A	US - A - 3 718 797 (PFENDER)		
A	US - A - 3 579 259 (KATO)		
A	US - A - 3 209 793 (MIURA)		
A	FR - A - 2 365 386 (ROCLA)		TECHNICAL FIELDS SEARCHED (Int. Cl.)
A	GB - A - 1 449 144 (REDLAND)		B 21 F
A	GB - A - 894 798 (J. ELLIS & SONS) -----		
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	27.05.1981	THE	